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THE MANAGEMENT OF NUCLEAR FUEL WASTE

FINAL REPORT

SELECT COMMITTEE ON
ONTARIO HYDRO AFFAIRS

JUNE 1980

4th Session. 31st Parliament
29 Elizabeth II

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ONTARIO HYDRO AFFAIRS
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NUCLEAR FUEL WASTE**

**THE LEGISLATIVE ASSEMBLY OF ONTARIO
THIRD AND FOURTH SESSION: THIRTY-FIRST
PARLIAMENT**



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THIRD AND FOURTH SESSION: THIRTY-FIRST
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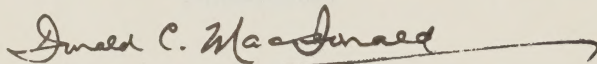
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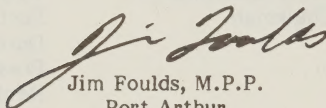
TO: THE HONOURABLE JOHN E. STOKES
Speaker of the Legislative Assembly of the Province of Ontario

Sir:

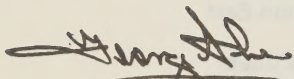
We, the undersigned members of the Committee appointed by the Legislative Assembly of the Province of Ontario on November 24, 1977* to inquire into various matters relating to Ontario Hydro, have the honour to submit the attached, final report on The Management of Nuclear Fuel Waste.



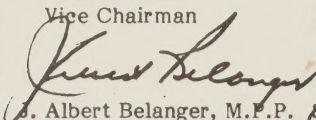
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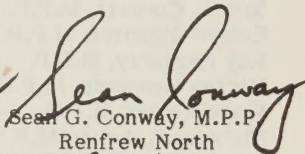
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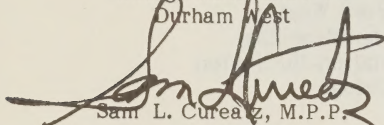
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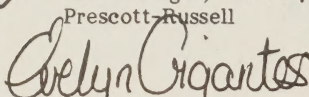
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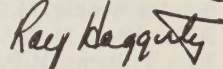
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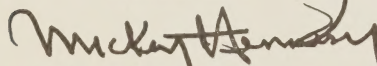
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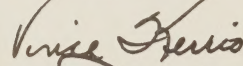
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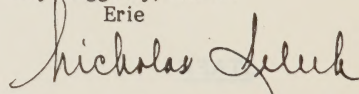
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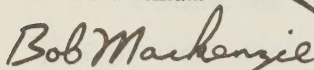
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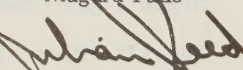
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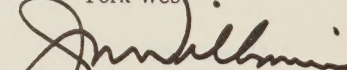
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* - Mr. Cureatz replaced Mr. McNeil on April 17, 1979;
Mr. Conway replaced Mr. Kerrio on May 31, 1979;
Mr. Kerrio replaced Mr. Nixon on December 20, 1979;
Mr. Mackenzie replaced Mr. Di Santo on June 19, 1979.

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CHAPTER 1

INTRODUCTION

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INTRODUCTION

The Select Committee on Ontario Hydro Affairs was established by the Legislative Assembly of the Province of Ontario on November 24, 1977 with Mr. Donald C. MacDonald, M.P.P. (York South) as Chairman. The Committee was ordered by the Legislature to examine and report on a wide range of matters that relate to the activities of Ontario Hydro. The Committee's complete terms of reference are included as Appendix A to this report.

The third of the Committee's terms of reference direct it "to examine Ontario's nuclear commitment", a concern first raised in the Legislature in June of 1976 in the report of an earlier Select Committee. The Committee began this examination with a two week hearing in October, 1978 in which a range of people, both proponents and opponents of nuclear power provided a variety of viewpoints on nuclear power in general and the management of irradiated wastes in particular. The Committee's Interim Report of November 1978, included as Appendix B, informed the Legislative Assembly of the need to conduct a full examination of Ontario's nuclear commitment and asked that its term be extended to permit the completion of this important work.

The Committee determined that a comprehensive assessment of nuclear power should include consideration of the need for nuclear power followed by an examination of each of the three major stages of the nuclear cycle. The first stage is the mining and milling of uranium ore and its refining and fabricating into fuel bundles. The second stage is the operation of the nuclear reactors for the production of electrical energy. In the third stage spent fuel bundles are removed from the reactor for immobilization and safe disposal.

The Committee's work began with a comprehensive assessment of the probable need for electricity over the next twenty to twenty-five years. A Special Report on the Need for Electrical Capacity was tabled in the Legislative Assembly in December of 1979. Then, in the wake of the accident at the Three Mile Island nuclear station, the Committee started its examination of the nuclear cycle at the second stage. Beginning in April of 1979, in sixteen weeks of hearings stretching over a full calendar year, the safety of Ontario's operating reactors was thoroughly examined. The Committee's findings, conclusions and recommendations on reactor safety are the subject of a separate report. The management of spent fuel wastes was the subject of Committee hearings in January, February and March of this year with this report presenting the resultant findings, conclusions and recommendations. Concerns about the first stage or 'front end' of the fuel cycle - mining, milling, refining and fuel fabrication - will be dealt with in subsequent sessions of the Committee.

Beginning in January of 1980, the Committee held 28 hearings to examine the Canadian nuclear fuel waste management program. Evidence was gathered from a wide range of witnesses including the Minister and Deputy Minister of Energy, officials and scientists of Atomic Energy of Canada Limited (AECL), staff of the Atomic Energy Control Board (AECB), executives of Ontario Hydro, independent experts from Canada and the United States and Ontario residents. The Committee

sought out the views of Ontario citizens in the two regions of the province where field work is currently underway. In a trip to Northwestern Ontario, the Committee visited the research drilling site outside Atikokan and held separate public hearings in Atikokan and Thunder Bay. Residents of communities near the White Lake research site in Eastern Ontario were encouraged to send written briefs and/or to appear in person before the Committee. Thirteen letters and briefs were received and distributed to all Committee members. Three local residents appeared in person. As well, the Committee visited the Whiteshell Nuclear Research Establishment near Pinawa, Manitoba to see, firsthand, some of the research being undertaken by AECL and to meet and talk informally with the scientists involved in the program.

The timing of the Committee's investigation of this topic was most propitious. The program has been underway long enough for some serious problems in its design or implementation to appear, but is not so far advanced that it is too late to take corrective action. In fact, one of the program's major problems is that delays inherent in the current approach have been holding back the critical field research work. Further, the Committee learned that the Province of Ontario is, at this time, reconsidering its own position in the program prior to negotiating continuing responsibilities with the Government of Canada.

The Committee is concerned that both governments take this opportunity to reconsider very seriously the fundamental arrangements for the program. The Committee found that, while there appears to be satisfactory progress in solving some technical problems, the program is in serious danger of foundering on the vagueness and apparent indecision about overall responsibility and appropriate public involvement that has served to confuse the public.

Chapter 2 of this report provides a general description of the Canadian approach to the management of nuclear fuel wastes before Chapter 3 outlines the problems the Committee found with both the approach and its implementation. Chapter 4 sets out the fundamental changes the Committee believes necessary to bring the program to a successful conclusion. The basic changes involve a new structure for managing the entire program and clarification of procedures for ensuring appropriate public involvement and safeguarding the public interest.

CHAPTER 2

THE CANADIAN APPROACH TO NUCLEAR FUEL WASTE MANAGEMENT

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The heat in a nuclear-powered electric generating station is produced through the radioactive properties of the uranium fuel placed inside the reactor's core. The uranium fuel is fabricated into ceramic pellets placed inside finger-sized Zircaloy tubes about one metre long. Zircaloy is an alloy of zirconium. Either 19, 28 or 37 tubes are bound together in a bundle. When a large number of bundles are placed inside the reactor core in the proper array and surrounded by heavy water, a continuous reaction takes place. Neutrons - small particles in the nucleus of atoms - escape from some elements and are absorbed by others, such as uranium - 235 or plutonium - 239. The absorption of neutrons makes these elements fission or split, producing heat and freeing more neutrons to cause more fissioning in a continuing reaction. After the fuel has been in the reactor for some time, the composition of the fuel changes with the new elements absorbing more neutrons than is desirable for the operation of the reactor. The reduction in the number of free neutrons reduces the number of fissions so that the heat being produced by the fuel begins to decrease. Fuel bundles that have reached this stage must be replaced to keep the reactor operating.

In the normal operation of a reactor, a considerable amount of radioactivity is created that must be safely contained and ultimately disposed of. For example, some of the deuterium in the heavy water that is in the CANDU core and flows around the hot fuel bundles absorbs neutrons and becomes radioactive tritium. Small bits of corrosion in the water become radioactive so that the filters used to purify the water pick up radioactive corrosion products. Used filters then become a radioactive waste product of the reactor that must be safely contained and disposed of. Over 99% of all the radioactive waste produced in a nuclear reactor, however, is contained in the used fuel bundles. The Committee, therefore, focussed its attention on the Canadian program for managing the highly radioactive spent fuel.

The Canadian program is carried out under a Canada-Ontario agreement developed on the initiative of the Ontario Ministry of Energy and announced jointly by the federal and provincial Energy Ministers in June of 1978. This chapter will set out the various parts of the program: first, the technical solutions being proposed; second, the current plan for arriving at a final solution; third, the institutional arrangements that are in place; and finally, the various ways in which the public is involved in the program, directly and through elected representatives.

THE TECHNICAL APPROACH

When fuel bundles are removed from the reactor, they are very hot, very radioactive and extremely dangerous. An individual standing one metre from a fresh, spent fuel bundle would receive a lethal radiation dose of about 200,000 rem per hour. (The AECB limit for the exposure of workers is 5 rem per year and, for the general population, one half a rem per year.) Spent fuel bundles must be immediately shielded and cooled before they can be transported to a facility for immobilization and ultimate disposal.

Interim Storage

Around the world ordinary water is commonly used to cool and shield used fuel elements on an interim basis. In Ontario, remotely operated fuelling machines take the used bundles and immerse them in water-filled storage bays that look like deep Olympic-sized swimming pools. It is intended that used fuel should remain in storage bays at the reactor site until it is removed for reprocessing or ultimate disposal. At one time there were concerns that the Zircaloy tubes would begin to corrode after a few years in the fuel bays. The plan had been to remove used fuel bundles from water storage after a few years and move them to another type of storage facility, such as an above-ground, dry, concrete canister. However, experience with fuel bundles in Canada and in other jurisdictions has shown that the Zircaloy tubes maintain their integrity and remain leak-free. No deterioration has been detected in bundles that have been immersed for more than twenty years. Each major Ontario nuclear station will have sufficient underwater storage capacity to keep all its spent fuel on site until there is a repository for ultimate disposal.

Transportation*

Ontario Hydro is responsible for all research and development leading to a proposed transportation program. While major movements of spent fuel will not take place until sometime in the future - possibly more than twenty years from now-spent fuel bundles are already being shipped. To date, Ontario Hydro has made approximately 300 shipments involving about 6,000 bundles or about 100 tons of fuel. This is equivalent to about half a year's used fuel from the Pickering A nuclear station although it has, in fact, come from all stations. Many of these shipments have been to AECL Research Laboratories for their work in assessing the durability of the older bundles and developing a final disposal scheme. Some were sent to Belgium for an international reprocessing research project. Around the world, there have been over 11,000 shipments involving about 12,000 tons of fuel, with most going to the fuel reprocessing facilities in The United Kingdom, Belgium and France.

All nuclear fuel shipments are made under AECB and international regulations that govern, among other things, the type of container used. The fuel is shipped in massive shielded steel containers weighing anywhere from 15 to 75 tons. The shipping containers include shielding materials, such as lead or depleted uranium, a cooling mechanism, such as water or convection fins, and an impact absorber pad to protect the flask in the event of a transportation accident. The containers are required to meet quite stringent tests including: a drop from 30 feet onto an unyielding surface, followed by and without repair, a drop of one metre onto a steel spike, followed by and without repair, a firetest of 800 degrees Celsius for half an hour, followed by and without repair, immersion in 50 feet of water for eight hours. There have been no reported incidents of nuclear material leaking from a shipping container since the international regulations went into effect. The only reported incident involving Canadian material occurred in 1960 before the regulations were in effect. The incident involved the shipment of experimental fuel rods from AECL's NRX research reactor at Chalk River to South Carolina. In that incident, cooling water in the container leaked out and spilled into a rail car while the shipment was in a United States rail yard. The spill was cleaned up with no significant health consequences reported.

*See dissent of Members Foulds, Gigantes and Mackenzie

Developmental work undertaken by Hydro is directed to determining exactly what type of container will be used (currently they use two different types), how the containers will be loaded, and which mode of transport will be favoured - barge, truck or rail.

In the course of the hearing the Committee devoted a special session to current practices in transporting radioactive materials. There is an extensive amount of radioactive material transported, both nationally and internationally. Radioactive isotopes are used in industry, in various research applications and for medical treatment and diagnostic purposes. Milled uranium ore is transported from mine sites to refineries. Refined uranium hexafluoride is shipped to fuel fabrication facilities. Fuel bundles are shipped to reactor sites. Refinery wastes have been shipped to disposal sites and are being shipped to uranium mill facilities. Enriched and experimental fuels are shipped from Canada to the U.S.A. and some used fuel bundles are shipped to AECL laboratories.

AECB's approach to its regulatory responsibilities for transportation safety combines concern for the strength and integrity of the package and administrative controls over the shipment. Many shipments, for example those involving medical and diagnostic isotopes, are made in containers considered to be of sufficient integrity that no additional administrative controls are required. Other shipments involving more toxic substances, such as highly enriched uranium or separated plutonium, require additional administrative controls including special security arrangements.

While the safety record for transportation of radioactive materials is not perfect, it is considered by the regulatory authorities to be very good. Transport Canada's Transportation of Dangerous Goods Secretariat consider radioactive materials to be one of the few toxic materials that are very safely handled.

The Committee does not dispute the excellent record that has been achieved. Its main concern is that the interaction between regulators and shippers leaves out any opportunity for the public or the municipal level of government to participate, even though, in the event of an accident, the emergency response will have to be made at the municipal level by agencies such as local fire and police departments. One concern is that years ago, the regulators stopped informing municipal governments of the movement of radioactive materials within their jurisdiction. The problem was that after years without incident the notices were disregarded. It may be possible however to set up an on-line information system to provide municipal agencies, in the event of an accident, with information on the nature of the substance being shipped. Such a system should, of course, apply to all toxic substances. A second concern is that the AECB does, on occasion allow shipments in containers that do not meet all the requirements if administrative controls on routing and availability of trained personnel are followed. The public may want to comment on whether that approach is adequate. Finally, the Committee is concerned that there appears to be no requirement for preparing municipal agencies to handle accidents involving radioactive materials. Radioactive materials are being shipped today. In the future, there will be large numbers of shipments of highly radioactive used fuel bundles through Ontario.

Accordingly the Committee recommends that:

RECOMMENDATION I THE AECB SHOULD MAKE KNOWN ITS CURRENT CRITERIA FOR REGULATING THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS AND ENCOURAGE PUBLIC DEBATE AND CRITICISM OF THEM; MUNICIPALITIES SHOULD, IN THE EVENT OF AN ACCIDENT, BE ABLE TO GET INFORMATION ON THE RADIOACTIVE MATERIALS IN THE SHIPMENTS, SHOULD HAVE THEIR STAFFS TRAINED TO HANDLE ACCIDENTS AND SHOULD BE PREPARED FOR AN EMERGENCY RESPONSE.

Immobilization

Once used fuel bundles reach the waste repository, they must be immobilized and prepared for ultimate disposal. The method of immobilizing spent fuel depends on whether or not it is reprocessed. Nuclear reactors use less than 1% of the mined uranium in the fuel. The CANDU design is somewhat more efficient in its use of uranium fuel than other reactor designs and was intended to be a "once through" fuel cycle with the bundles disposed of after one use rather than reprocessed. In most countries, plans are underway to reprocess spent fuel to isolate the material that is still useful - doubling the energy released from mined uranium. The Government of Canada has not made any decision on whether or not to reprocess fuel. That decision will be made after full consideration of the recently completed International Fuel Cycle Evaluation. Until a final decision is made, the Canadian waste management research program must consider both "once through" wastes and reprocessed wastes.

Whatever form the waste might take, immobilization will ensure it is in a highly insoluble solid form and contained in a durable man-made container. If the fuel is not reprocessed, it will remain a solid ceramic pellet in the Zircaloy fuel bundle. In this form, the radioactive poisons are bound into a very solid, leach-resistant material and contained within relatively thin but quite durable metal tubes. It is intended that the bundles will be placed inside a heavy container designed to withstand high pressures, to dissipate heat and to resist corrosion or breakdown from high fields of radioactivity. The container, possibly made of stainless steel, would be filled with molten material, possibly lead, that would solidify around each tube of the fuel bundle, providing additional shielding while the fuel is emplaced for final disposal. If the fuel processing option is chosen, the various wastes from reprocessing will be immobilized in solid glass blocks. In fact, AECL pioneered in the vitrification of reprocessing wastes. Several glassy blocks containing radioactive wastes were buried near the Chalk River Laboratories in the fifties. The leaching of radionuclides from the blocks into the surrounding soil that has occurred is being continuously monitored and some blocks have been retrieved for more careful study. Newer materials that are more resistant to leaching have since been developed.

Final Disposal

The waste fuel, as a solid form sealed into a durable container, must still be ultimately disposed of. The radioactive products in spent nuclear fuel pose a threat to human health for a period of time that is longer than the history of civilization. The initial threat is the most intense. It comes from the heat and radioactive emissions of the active fission products. After about 600 years these

products will have decayed to relatively low levels. For several hundred thousand years, radioactive emissions from long-lived elements called actinides continue. After about 17,000 years unprocessed spent fuel has about the same level of toxicity as the Elliot Lake uranium ore body from which it was taken. Given the very long life of these toxic materials, no man-made containment system can ever be predicted to give sufficient protection. All over the world scientists are looking for ways to use nature as a final barrier.

Many alternatives have been suggested and studied, including: shooting the waste into space or the sun; burying it in the Arctic or Antarctic ice caps; laying it on or under the deep ocean floor; or burying it deep within geologically stable formations such as salt, certain hard rock, shales or volcanic ash. The international consensus, after many different studies, is that deep burial in geologically stable formations is the best option for further investigation and development. Secondary consideration is being given to burial under the oceans. Throughout the world, countries are investigating the geologic formations most appropriate to their own circumstances. Germany and the United States, for example, have extensive programs of research into the possibility of utilizing the large salt domes that underlie parts of their countries. In Italy, where there is earthquake danger, investigations of the self-sealing quality of indigenous shale is being studied. In Canada and Sweden, emphasis has been put on hard, crystalline rock. In Canada, the entire Precambrian Shield contains large amounts of such rock and is known to have been geologically stable for hundreds of millions of years. Within the Precambrian Shield attention is focussed on plutons, large masses of rock deep in the earth's surface with small outcroppings showing at the surface. Plutons are an attractive final disposal medium because, in addition to their geologic stability, they contain no known minerals of any commercial value.

A major part of the Canadian research program is devoted to understanding the characteristics of plutons. Plutonic rock has not been studied in the past because it lacks economic value. The key element of the current research is to understand water movement through the rock because water movement is presumed to form the main pathway for radioactivity from a buried container to man. Studies are now underway to determine how extensively plutons are cracked at varying depths, whether the cracking is predictable, the amount and movement of water at varying depths, and the ability of the rock to absorb radionuclides.

THE CURRENT PLAN

In Canada, plans for disposal of nuclear fuel wastes come under an overall scheme developed primarily by AECL with input from other involved organizations. The plan is to move slowly in four distinct phases to an acceptable solution. The four phases are: concept verification; site selection and acquisition; disposal demonstration; and full scale operation.

Phase One: Concept Verification

The first phase is currently underway. In concept verification, AECL will be doing a good deal of research to develop the scientific tools necessary for all subsequent work. The objective is to verify that the concepts underlying the proposed Canadian disposal system will lead to a safe, environmentally acceptable solution. Under the direction of AECL the concept verification phase involves federal and provincial agencies, universities and private industrial organizations.

In laboratories, research is being done to understand how different waste forms are affected by water of different chemical compositions, how different container materials interact with different waste forms and types of ground water, and how various minerals and rock types absorb radioactivity under different conditions. Additional and very important research is carried out in the field, studying different kinds of plutons and the water chemistry found in plutons.

When the overall plan was first put together, it was envisaged that the concept verification phase would be concluded in 1980. However, the work in this first phase of the program has been considerably delayed. Only two of the eight categories of plutons have been drilled and it is quite possible that no additional drilling will get underway this year. During the hearing AECL announced that 1982 is now seen as the earliest that concept verification could conclude. However, if field work delays continue, it could well be 1983 or 1984 before this phase concludes. Since current interim storage arrangements have proved satisfactory, there is no indication that this or any subsequent delay will create a safety problem. The main concerns with continuing delays are that they erode public confidence in the program, increase public confusion about its progress and add to the overall cost of research.

At the conclusion of the concept verification phase a safety and environmental assessment will be published and widely disseminated based on the technical information assembled during this phase and already being distributed in Technical Reports. The documentation is intended to assure the scientific community and general public that the basic concept of effective isolation through man-made and geological barriers is sound, that sufficient information is available to select a site, and that it is reasonable to proceed to develop engineered solutions. It is expected that governments will have to approve the assessment before the next phase can begin.

Phase Two: Site Selection and Acquisition

AECL believes that, on the basis of information obtained in the concept verification phase, it will be possible to recommend a large number of plutons that are suitable as a waste repository. Specific information on the proposed facility, including the economic impact of developing the site and operating the repository, as well as all known potential safety, health and environmental concerns will be discussed with the involved communities. Through a mechanism that is as yet undefined, but will undoubtedly include extensive public hearings, governments will eventually choose one site. AECL believes that the choice will be from among a handful of communities that will ask to have the facility and its associated jobs located there. Others believe that governments will have to impose the repository on some part of the province. Ultimately though, a single site will be selected and acquired.

On the original plan, the site selection phase was to have concluded by 1983 - or about 2 to 3 years after concept verification. If concept verification is now not to be completed before 1983 or 1984, then site selection may not take place until 1987 or even later. It is not inconceivable that this second phase, too, will take longer than had been originally planned. Whatever the time frame, site selection is not planned to commence until the concept verification phase is concluded.

Phase Three: Disposal Demonstration

Once the site is acquired, normal mining operations will commence to sink the necessary shafts and excavate the disposal area. The plan is that the underground facility would be extensively tested over a number of years to demonstrate the scientific assumptions developed during the concept verification phase. For example, specific confirmatory measurement of the amount and movement of water through the rock can be made. Heaters can be placed in mined-out cavities to verify the ability of the rock to dissipate heat without undue mechanical stresses or fracturing.

At the same time, a pilot waste immobilization facility could be constructed on the surface. This facility could receive small quantities of nuclear fuel waste and work through the engineering processes of immobilizing and sealing sample containers for final disposal. If the behaviour of the rock is shown to be at least as favourable as was assumed from concept verification, then small quantities of packaged waste could be emplaced in holes, packed with the intended backfill and monitored. Measurements of the effect of heat and radiation could be carefully assessed. If serious problems develop, the wastes could be retrieved and replaced in an interim storage facility until the problems are resolved. If at any time it becomes apparent that the site is not satisfactory, it could be abandoned with all radioactive material removed and a new site selected and developed.

On the original schedule, it was envisaged that demonstration could take up to fifteen years - from 1985 to 2000. Since the overall timetable is slipping, that fifteen year period will now extend into the 21st century. Not before that time will any nuclear fuel waste is finally emplaced for permanent disposal.

Phase Four: Full Scale Operation

The Canadian plan is that a full-scale commercial operation will be developed only when the disposal technology has been demonstrated at the actual site. At that time the immobilization plant on the surface will receive substantial deliveries of material. If no reactors are built in Ontario beyond Darlington (the nuclear station that is intended to come on line between 1988 and 1991) the facility would have to be prepared to handle each year, from Ontario reactors, about 2,274 tonnes of fuel bundles containing 1,840 tonnes of uranium or about 4,500 cubic metres of material. This is equivalent to filling a Canadian football field between the 15 yard lines to a depth of one metre. However, if the repository is intended for national use, then it will have to handle at least an additional 107 tonnes of bundles per year from the New Brunswick and Quebec reactors and, presumably, will have to have additional capacity to begin to reduce the large inventory of spent fuel that will, by that time, have accumulated in the spent fuel bays of Canadian stations.

INSTITUTIONAL ARRANGEMENTS

The Canadian nuclear fuel waste management program involves a considerable number of organizations and many people. A variety of disciplines and expertise are required to provide the technical solutions. Some groups will be more involved in the development of the program while others will be involved in assessing the adequacy of the proposal.

Responsibilities for Developing the Program

The overall program covers the four areas described above: interim storage, transportation, immobilization, and permanent disposal. Responsibilities for each area were assigned in the Canada-Ontario Agreement. Ontario Hydro has prime responsibility for interim storage and transportation; AECL for immobilization and final disposal. While all four aspects are critical in the overall program, there is a far greater research component required in AECL's areas of responsibility. Interim storage and transportation are already ongoing activities in Canada and around the world. Immobilization and disposal are still in the research stage.

AECL's mandate, since its creation in 1945, has been to conduct research and development into the peaceful uses of nuclear energy. AECL has developed cancer therapy units and is world leader in the supply of radioactive isotopes for medical purposes. AECL's success in developing the CANDU reactor is one of its outstanding achievements. Now it has the challenge of developing an acceptable solution to the waste disposal problem.

While AECL has prime responsibility for immobilization and disposal research, it does not undertake the work entirely on its own. Various branches of Energy, Mines and Resources Canada and Environment Canada have provided expertise and direct assistance. Ontario Hydro also assists in technical areas such as the design of the immobilization facility and in certain environmental assessments. Although in the past AECL has tended to conduct nuclear research entirely within its own organization, in this program, it has reached out to the universities and private industry to involve a wider community. In the First Annual Report on the program, issued in December of 1979, AECL lists 22 industrial organizations and 9 universities that are making major technical contributions.

Regulatory Authority

Under the Atomic Energy Control Act passed by the Federal Parliament in 1947, the Atomic Energy Control Board is responsible for regulating the safety of all nuclear facilities, including those for waste disposal. A geologic repository for the disposal of nuclear fuel wastes is quite different from the other nuclear facilities regulated by the Board and will offer the Board a new challenge in coming up with an appropriate set of regulatory criteria. Among the unique requirements waste disposal places on the Board are the need for:

Knowledge of geology. In no other aspect of the Board's work is an extensive knowledge of geology required. In assessing the adequacy of proposed repositories however, AECB must deal with new geological information based on original research undertaken just for the nuclear fuel waste management program.

Consideration of future generations. There is ample technology available to contain nuclear fuel wastes safely under controlled supervision for an indefinite period. Current interim storage arrangements in water-filled bays appear to be satisfactory for thirty years or more. Demonstrations of dry storage above ground in concrete canisters indicate that spent fuel could probably be

stored safely for a very long period of time with controlled supervision. However, these arrangements impose upon future generations the responsibility for ongoing surveillance and supervision. In addition to environmental and health concerns, the existence in spent fuel of potential nuclear weapons material makes constant vigilance necessary. Permanent underground disposal also has implications for future generations. The more permanently the waste is emplaced, for example, the more difficult it will be to retrieve in the event of difficulties. And, the more carefully the site is returned to its natural condition, the greater the likelihood of accidental incursions.

Forecasts of technical performance. The fission products in the spent fuel will generate considerable amounts of heat and radioactivity for about 600 years. The longer-lived actinides, mainly plutonium, will be radioactive for one-quarter to one-half a million years. Nowhere in man's experience has it been necessary to rely upon predicted performance of natural and man-made phenomena beyond the time frame of civilized life on the planet. Judgements on the adequacy of a particular proposal will, of necessity, depend upon acceptance of various extrapolations from short-term experimental observations.

Despite the difficulties, the AECB will ultimately have to make a decision on the acceptability of the Canadian program. In fact, the Board will have an input at several stages of the program and is already doing a good deal of work to get ready to fulfill its responsibilities.

Later this year the AECB will issue a set of preliminary guidelines, specifying the information required in applications for site acceptance, construction approval, and provision of an operating licence. These guidelines will provide both the public and the program managers with an idea of the kinds of criteria by which the AECB will make its regulatory decisions. In preliminary form they will be available for public comment well in advance of their ultimate regulatory application.

When the concept verification documentation is complete, the Board has agreed to make a statement on the acceptability of the concept. In preparation for this assessment, the Board is adding staff with geological expertise and has formed an interdepartmental working group which includes representatives of Environment Canada and the Ontario Ministry of the Environment.

Finally, the AECB has decided that the basic steps leading to the licencing of other nuclear facilities will apply to a waste disposal site. That is, there is a requirement for public information before site selection, the proposed site must be approved by the Board and Board approval will be required for the beginning of construction, the emplacement of radioactive materials, full operation, and eventually monitoring and surveillance of a closed site.

The current plan for the development of a full scale waste repository does not envisage operation before the turn of the century. Nevertheless the regulatory body is already at work to fulfill its responsibilities.

Technical Advisory Committee

Several public reviews of the waste management program called for greater independent review than has been the case in other nuclear developments. In mid-1979, AECL established the Technical Advisory Committee, an independent peer review committee, to advise it on the extent and quality of the technical program.

The Committee, under the chairmanship of Dr. L. W. Shemilt, former Dean of Engineering at McMaster University and Professor of Chemical Engineering, is made up of ten members, selected from a list of nominees submitted by the major scientific and engineering societies in Canada, specifically The Canadian Association of Physicists, The Canadian Federation of Biological Societies, The Canadian Geoscience Council, The Canadian Institute of Mining and Metallurgy, The Chemical Institute of Canada, and the Engineering Institute of Canada. On the advice of the Committee, the membership will shortly be expanded by two to include nominees from The Biological Council of Canada, and the Information Processing Society of Canada.

Four features of the Advisory Committee should assure its autonomy and ability to provide a competent peer review.

- (1) Membership is open only to persons nominated by the learned societies.
- (2) The Committee will report publicly on an annual basis.
- (3) The members are assured full and free access to all aspects of the research process.
- (4) The Committee has resources available to it for obtaining further specialist advice through consultants as it sees fit.

Overall a large number of organizations and individuals have been assigned responsibility in the Canadian nuclear fuel waste disposal program. AECL has responsibility for managing the research on immobilization and ultimate disposal. Ontario Hydro has responsibility for developing the transportation and interim storage solutions. AECB has responsibility for establishing and conducting the regulatory approval. The Technical Advisory Committee operates independently of each of the government agencies to make its own objective assessment of the technical research. Nuclear power was developed in Canada behind closed doors and in the informal network of the "nuclear establishment". The program to deal with nuclear wastes will be handled with considerably more formality and with greater public involvement.

POLITICAL ARRANGEMENTS

Nuclear fuel waste management is somewhat unusual in that it naturally and legitimately involves several levels of government. The federal government has a long history of involvement in the peaceful development and regulation of atomic energy. In Ontario, fuel waste is produced, directly, by the operation of the

nuclear reactors of Ontario Hydro that produce electrical energy for the benefit of the entire province. It should be noted that the West System, which covers Northwestern Ontario, is basically self-contained. The interconnection to the West System was used extensively in 1977 during drought conditions with a maximum of interchange of over 300 megawatts. Still, the West System does not normally rely upon the electricity produced in the East System where all the nuclear capacity is located. Finally, a waste disposal facility will ultimately impact most significantly on the communities located closest to it.

In contrast to other parts of the nuclear industry, the broad impact of the fuel waste program has been recognized by the open involvement of all levels of government and a commitment to providing a regular flow of information to the public. The involvement of the federal and provincial levels of government is explicitly recognized through the Canada-Ontario agreement announced jointly by the federal Minister of Energy, Mines and Resources and the Ontario Minister of Energy. Involvement of locally elected representatives is set out in an agreed process of briefings for M.P.s, M.P.P.s and municipal councils in every region where field research activities may be carried out. In addition, AECL has undertaken to discuss with the Ontario public and, most particularly, residents of the Canadian Shield, the various aspects of the program, including the possible risks and benefits of a waste disposal facility.

The Canada-Ontario Agreement

On June 5, 1978 a joint statement was tabled by Energy Minister Alastair Gillespie in the House of Commons and by Energy Minister Reuben Baetz in the Ontario Legislature. The statement committed each government to work together on the first phase of a long-term program "to assure the safe and permanent disposal of radioactive waste from nuclear power reactors". Under the agreement, research on immobilization and disposal was assigned to AECL as a federal responsibility while interim storage and transportation were to be a provincial concern.

The program enunciated in the Ministerial statements covered only the first, or concept verification phase, and is restricted to testing of "intrusive igneous rock" (the plutons on which field research is concentrated). However, the statement did envisage a further agreement on the phases beyond concept verification being concluded between the two governments "as quickly as possible."

It was recognized that the success of the program required "continuous close co-operation and consultation between the two governments, and their agencies." One mechanism for ensuring the close working arrangement was the establishment of a Co-ordinating Committee with an AECL chairman and representatives from Ontario Hydro, the Ontario Ministry of Energy, and the federal Department of Energy, Mines and Resources.

Through the Agreement and the Co-ordinating Committee mechanism set out in it, Ontario was given the opportunity to participate fully and extensively in the entire program. The minutes of the Co-ordinating Committee, publicly released at the request of the Select Committee provide insight into the nature of the Province's involvement.

Municipal Liaison

A central focus of the program has been the development and maintenance of a public information process to ensure that in all the field work being undertaken for the program locally elected representatives, including federal and provincial elected members as well as municipal councils will be fully involved. To date, the field work has focussed on research into the characteristics of selected plutons.

- * At Forsberg Lake near Atikokan, three holes have been drilled to determine, among many other research objectives, the extent to which cracking or fracturing of the rock at varying depths can be predicted from the surface characteristics of the pluton.
- * At White Lake in Eastern Ontario, holes drilled several years earlier and for another purpose by the Geological Survey of Canada are being studied to learn more about the characteristics and movement of water through plutons.
- * At the Whiteshell Nuclear Research Establishment of AECL near Pinawa, Manitoba a granite pluton has been drilled to various depths to better understand the characteristics of granite plutons.
- * At the Chalk River Nuclear Laboratories near Deep River, Ontario, a highly fractured granite pluton was drilled to develop the tools and techniques to be used in subsequent geologic investigations.

Since securing the Canada-Ontario Agreement in 1978, the Province has concentrated its efforts on an approval process for the field work undertaken in Ontario. When AECL wishes to do field drilling or to conduct other field studies in Ontario off AECL property it must go through a seven step approval process. If the studies are carried out on AECL property in Ontario or Manitoba, the approval process does not apply. The seven step process is:

Step 1 AECL proposes a public information program for one of the thirteen regions into which the Precambrian Shield area of the Province is divided. Approval is requested for briefing the M.P.s and M.P.P.s in the region.

Step 2 AECL reports to the Co-ordinating Committee on the briefings and requests permission to carry out further public information activities in the region.

Step 3 AECL conducts public information activities in the region, involving contact with community leaders and the local media.

Step 4 AECL proposes a community relations program in a particular area within the region and requests permission to brief the local M.P.s and M.P.P.s again.

Step 5 AECL reports to the Co-ordinating Committee on the briefings and requests permission to carry out community relations activities in a particular area within the region. If approved, AECL proceeds to contact municipally elected officials. Local councils are formally briefed at an open meeting. A public meeting co-sponsored by AECL and Council is held to answer public questions. The local media are informed about the proposal and AECL seeks a resolution from the municipal council approving the field program.

Step 6 M.P.s and M.P.P.s are briefed again.

Step 7 Finally, AECL is able to request permission to initiate the field research or other field activity.

This process is required even though field work to date is of a general nature and not intended to locate specific sites for the repository.

At each step in the process, either the federal or provincial government can refuse permission to proceed. AECL's practice of seeking a municipal resolution gives the closest organized municipality the opportunity to stop the program. Ultimately then, there is a veto power at all three levels of government on all field research activities.

Public Information

Although Canada's work in the development of uses of atomic energy is entirely for peaceful purposes, information on our nuclear industry has not been freely available to the public. Through the efforts of this Select Committee, information is now far more available to the interested public. Two reasons were given for restricting access to information:

- (1) to ensure that information which could prove a security risk is not revealed;
- (2) to safeguard products, process or ideas that may have commercial application.

Neither of these factors pertain in nuclear fuel waste management. Although spent fuel contains material that could be converted into weapons, the waste management program relates only to storage and disposal where security requirements are not substantial. And, an international agreement to share full information on waste disposal among all jurisdictions, has eliminated commercial advantage.

AECL carries the main public information responsibility for the program. It has established a public information group for the waste management program to carry out a wide range of activities. Over 100,000 copies of a brochure on the program have been distributed. A film has been shown to more than 50,000 people. A newsletter is sent to 4,000 people. There is a toll-free information line. And the program is described in some detail in an AECL publication, Management of

Radioactive Fuel Wastes-The Canadian Disposal Program as well as in The First Annual Report of The Canadian Nuclear Fuel Waste Management Program.

Each of these vehicles provide information to the general public. As well, AECL has attempted to keep the technical community informed of its activities. Twenty-six articles have been published in scientific journals. Technical reports are prepared as each major research project is completed. These reports are distributed to forty-one libraries across Canada, twenty-three in Ontario alone, and are available on request from AECL. As well, the Technical Advisory Committee described above provides a "window" on the program for the scientific and technical community. Their annual report will be public.

* * * * *

The Canadian nuclear fuel waste management program is a substantial undertaking. Extensive research and development is being conducted in a number of areas. The plan leading up to a full scale repository leads into the twenty-first century. Various institutions and agencies and many individuals are involved. And, unlike other parts of the nuclear industry, the fuel waste management program explicitly involves several levels of government and is committed to the provision of information to the public.

CHAPTER 3

FUNDAMENTAL IDENTIFIED WEAKNESSES

CHAPTER 3

FUNDAMENTAL IDENTIFIED WEAKNESSES

The Canadian nuclear fuel waste management program is large and multifaceted. It has reached out for the skills and expertise of a number of talented Canadian scientists and engineers. Although many features of the program are sound, there are many important problems in the program that must be overcome if it is to reach an acceptable conclusion. In the view of the Committee it is essential to recognize that the technical solution to the disposal of nuclear fuel wastes must, ultimately, be acceptable to the people of Ontario and especially to those living in the vicinity of a proposed repository. The Committee uncovered many shortcomings in the program that will create difficulties in coming to the consensus necessary to move the program beyond the current research phase into site selection and demonstration. The shortcomings in the program are in many areas. There are some lingering doubts about the technical program and its success is not assured. Of more significance to the questioning public are the unresolved questions of ultimate responsibility. And, there are serious concerns about the provincial involvement in the program, the concept of community agreement and the availability of pertinent information. This chapter will cover each of these shortcomings in turn.

TECHNICAL DOUBTS

The technical approach being followed in Canada mirrors, in many essentials, the consensus approach of the international scientific opinion favouring deep geological burial of immobilized waste. While there is justifiable optimism that this approach will ultimately be successful, the assumptions on which it is based have not yet been established. Among the many possible geologic media for deep burial, Canada has chosen to focus its efforts on the igneous, crystalline rocks of the Canadian Shield: the kind of rock a layman would probably identify as granite. In this, as in other respects, the Canadian program is quite similar to a proposal that has been put forward by Swedish authorities. There are concerns about Canada's total pre-occupation with granitic rocks in all the field work undertaken to date.

International Doubts

Many studies by experts around the world have reached the same conclusion: deep geologic burial is the most promising approach to nuclear fuel waste disposal. In Canada, a report prepared by a three man committee of experts under the chairmanship of Dr. F.K. Hare, Dean of Environmental Studies at University of Toronto for the Minister of Energy, Mines and Resources confirmed this approach for Canada. This report, The Management of Canada's Nuclear Wastes, also envisaged the choice, by 1983, of at least two hard-rock sites in Ontario to be developed for geological disposal. Similar acceptance of geologic disposal can be found in several U.S. studies, such as those of the Ford Foundation and the American Physical Society, and by Swedish, British and German studies and commissions.

In Sweden, the Federal Parliament stipulated that reactor operators must show how and where spent nuclear fuel will be stored with absolute safety before fuel can be loaded into any new nuclear reactor. The Swedish electric utilities established a special project group, The Nuclear Fuel Safety Project (KBS), to show that the requirements of the Stipulation Law can be met. The KBS Project produced a comprehensive set of reports on all aspects of fuel immobilization and final disposal. The reports were sent to twenty-six organizations around the world for international comment. In Canada, for example, the reports were sent to the Hare Commission, the Geological Survey of Canada, and the Department of Geological Sciences at the University of British Columbia. The comments of the "foreign experts" were published and made available in Sweden and to others requesting a copy from Swedish authorities.

The comments were instructive in appraising the Canadian program, not just because the Swedish proposal is similar to the Canadian approach, but also because the comments gave a good indication of the range of uncertainty that still exists on the basic data and assumptions that underlie proposals for the disposal of spent nuclear fuel wastes. On corrosion of the man-made barriers, for example, the National Corrosion Service of the United Kingdom replied that:

"The proposal...in the area of corrosion and indeed we must assume in other areas, go far beyond the currently available experimental data base."

On the natural, geological barrier, the Energy Resources Conservation and Development Commission of California stated that:

"Generally we believe that the work in the U.S. and Sweden is constrained by a certain lack of fundamental scientific knowledge in the application of earth sciences to the problem."

As a last example, in the translation of potential releases into effects on the health of workers at the repository, Energy Incorporated of the U.S.A. responded that

"...more detailed health physics work needs to be done to assure the safety of the personnel..."

These comments should not be construed as an outright rejection of the KBS proposal or of the international consensus approach. In fact, the Swedish Energy Commission accepted the KBS report for purposes of the Stipulation Law. It does indicate, however, that a finally accepted solution has not yet been found. And, while AECL may well agree that, in fact, a fundamental scientific basis is exactly what they are trying to assemble in the Concept Verification phase, it is important to the perspective one takes in assessing institutional and political shortcomings to recognize that the technical solution is not yet assured.

Geological Diversification

In Canada, field studies have been entirely on the granitic rocks. This strategy has been questioned by a number of knowledgeable people. In 1977, the Hare Commission suggested that, while the program should focus on hard, igneous rock, Canada should keep abreast of the soft rock technology including, if

necessary carrying out sufficient field work to classify available soft rocks. The Canadian Geoscience Council reiterated this suggestion with, perhaps, even greater emphasis on the need for field work.

These concerns are accepted by the active participants in the current program -Ontario Hydro and AECL. Ontario Hydro proposed to the Co-ordinating Committee that field investigation of shales on Hydro properties should be undertaken. The management group at Hydro, looking ahead to future public assessments of the program, were concerned that the Canadian choice should be seen to be from at least two alternatives. In his concluding remarks to the Committee, Dr. S.R. Hatcher, Vice-President and General Manager of Whiteshell Nuclear Research Establishment of AECL and the head of the disposal research activity, reaffirmed his strong conviction that a small country should focus its activities on one geologic media, but he agreed that it would be appropriate to initiate a small amount of field work on clays and shales. The field work is apparently necessary in order to make effective use of the internationally available information on soft rock.

Despite the expert consensus, no Canadian field work has been initiated on soft rock. Evidence before the Committee indicates that the Ontario Ministry of Energy has opposed drilling on alternate media because it is not specifically mentioned in the Canada-Ontario Agreement. In fact, the Deputy Minister of Energy stated that it would take as much discussion and understanding to reach an agreement on initiating field work in one of the soft rocks as it did to reach an agreement on the igneous rock program. On that basis, Ontario will not even allow public information activities in the southern parts of Ontario where suitable soft rocks can be found.

During the Committee's hearings The President of the United States announced his conclusions on the course he wished the American nuclear waste management program to take. That announcement followed an extensive review of the American program by an Interagency Review Group in Washington, a review that had been widely circulated for comment of all interested parties in that country. The President concluded that it was imprudent to concentrate exclusively on one rock type (the U.S. focus has been on salt) but that immediate attention should turn to locating and characterizing a number of potential sites, in a variety of different geologic environments with diverse rock types.

The Committee believes strongly that some field work on alternative geologic media for waste isolation must be carried out in Canada and recommends that:

RECOMMENDATION II THE GOVERNMENT OF ONTARIO SHOULD CEASE ITS OBSTRUCTION OF PROPOSALS TO INVESTIGATE AVAILABLE SOFT ROCKS IN THE FIELD AND SHOULD, INSTEAD, ENCOURAGE ALL APPROPRIATE FIELD RESEARCH

OUR INSTITUTIONS ARE LAGGING

The several Canadian institutions and agencies involved in the Canadian program have, in many important areas, been slow in sorting out current responsibilities and have left responsibilities in future phases very vague.

Sorting Out Current Responsibilities

Operating under the Canada-Ontario agreement, with a Co-ordinating Committee and primary responsibilities divided between AECL and Ontario Hydro, the current phase of the program appears, at the very least, to be well organized. The Committee found though that in several key areas, responsibilities have not been clearly assigned and the specific goals of the phase have not been satisfactorily defined.

Under the terms of Atomic Energy Control Act, the AECB is responsible for all works and activities related to nuclear power, including the management of nuclear wastes. However, the omnibus responsibility of the AECB does not, in itself, sort out all the regulatory mechanisms that will be followed. In the expansion of uranium mines at Elliot Lake, for example, the Ontario Environmental Assessment Board held public hearings and wrote an extensive report, although the regulation of uranium mining is clearly under the jurisdiction of the AECB. Further, many responsible officials have assured concerned members of the public that full open public hearings will be held. The AECB, under its current legislative mandate, does not have the power to hold formal public hearings. Even if it is given this power, no one can assure the public that any future public hearings will take place either in whole or in part under the authority of the Board. Neither the mechanism for, nor the extent of, future hearings is clear.

The second Committee concern is the lack of clear definition of how each of the program's phases will end. For example, the Committee could not find a full and satisfactory description of how "concept verification" concludes. AECL has indicated that it will produce a document when it believes there is sufficient scientific data to verify the concept. The document will be widely circulated and comments and criticisms will be encouraged. The AECB has committed itself to commenting, as has the Technical Advisory Committee. This process, without further elaboration, leaves unanswered such critical questions as:

- Who decides whether the concept is fully verified, or put another way, who decides whether AECL is sent back to do further research or allowed to proceed with site selection?
- How and from what groups will comments be sought, will the search for comments be active or passive and who will receive and appraise the comments?
- Is AECL the sole arbiter of when there is sufficient information to issue the document and will it include all relevant background data?
- Will public funding be available to the technical or general publics?
- Will international or outside expertise be sought, and if so, by whom?

None of these questions have been answered to the Committee's satisfaction. And, in the absence of answers to questions of detail, concerns can and do arise that criteria for judging the adequacy of concept verification may be adjusted to fit the analysis that can be produced.

Clarifying Future Responsibilities

Roles and responsibilities for the phases beyond the current one are even more vague and undefined. The role of both the federal and provincial governments and their respective agencies remain ambiguous.

The Ministers' announcement of a Canada-Ontario Agreement clearly stated that further agreement on site selection and acquisition and disposal demonstration was required and that such an agreement should be concluded "as quickly as possible." Two years later the Committee was informed that virtually no work has been done between the two governments to reach such an agreement. The Canada-Ontario Agreement specifies AECL's primary responsibility for research and development on the immobilization and disposal of radioactive wastes. There is, however, no discussion of the ultimate responsibility for proposing, demonstrating and operating the ultimate repository.

In the absence of a specified alternative, it is presumed that AECL will continue with its responsibilities for both immobilization and disposal beyond concept verification. Yet some critics believe that assuming the operating responsibility will compromise AECL's credibility as a pure research agency. As well, it has been suggested that AECL's clear predilection to find a solution to fuel waste management (thereby eliminating one significant area of controversy over the acceptability of nuclear power) also seriously compromises its credibility as an independent research organization. In any event, it is the Committee's view that full, ultimate responsibility must be assigned to one agency at the earliest possible opportunity.

In The Management of Canada's Nuclear Wastes, the Hare Commission, in 1977, recognized the same shortcomings in the Canadian program. It recognized that the public would want to know precisely who is responsible for the final disposal facility. The Hare Commission recommended that full, ultimate responsibility could be given to AECL or to a special agency created for this purpose.

In the absence of an assignment of clear final responsibility the answers to many critical questions remain unavailable. For example, it is difficult to assess the allegations of some critics of nuclear power that the cost of waste disposal will be sufficient to compromise the currently assumed advantage of nuclear power over coal. The Committee could not find in any of the agencies currently responsible for pieces of the program satisfactory and complete answers on financial details. It was difficult for the Committee, and will continue to be difficult for the public, to have confidence in this vital program when specifics and responsibilities are left vague and undefined.

POLITICAL INADEQUACIES

In contrast to other aspects of the nuclear industry, the need for involvement of the federal and provincial governments, locally elected officials, the scientific community and the general public has been recognized throughout this program. However, recognition alone is not sufficient. And, while conceding that waste management is a very difficult area to handle, the Committee has concluded that arrangements to date have not been satisfactory. The provincial role has not been as productive as it might have been expected to be. The effort to gain community approval is inadequate, incomplete and confusing. And, neither the general public nor the scientific community are receiving the information required.

Provincial Role Limited

The Canada-Ontario Agreement gives the Province the right to "full consultation and prior agreement at each step of the process." Curiously, the Ministry of Energy has not used this general authority to give it any involvement in the substantive aspects of the program. Through the evidence of Ministry officials and by inspecting the minutes of the Co-ordinating Committee, it became apparent to the Committee that the Ministry plays no significant role in either the technical or management aspects of the program even though a lack of clarity in certain aspects of these areas has added to public confusion and concern. Specifically,

- * The Ministry has apparently neither questioned, commented on, or participated in any of the technical issues, nor made any effort to ensure that criteria be set for the technical program that are satisfactory to the Province.

- * The Ministry has never commented on the adequacy of the current schedule, even as its part in the decision making process created delays that have made the schedule clearly unrealistic. The Ministry is aware, of course, that satisfactory interim storage arrangements mean that delays will not add any significant public risk. The unrealistic schedule does, however, decrease public confidence in the program. The Ministry appears unconcerned over the uncertainty about ultimate operational responsibility and the loosely defined conclusion to several of the program's phases although the Committee found the questions to be of some concern.

- * The Province has interpreted the Canada-Ontario Agreement to prevent any field work from being undertaken off the Precambrian Shield, and has worked to keep both Ontario Hydro and its own officials from being associated with the locally unpopular AECL field work.

The Ministry has not by any means been inactive though. Even beyond the very substantial efforts required to get the Canada-Ontario Agreement, the Ministry has played a major role in the area of field studies. The Ministry expended a good deal of effort in setting up the seven step approval process for field studies. The Ministry insisted that AECL consult with elected officials in

each region and area where field work might be undertaken. Further, the Ministry interpreted the agreement to give it the right to stop or indefinitely delay field work as it saw fit. The evidence also shows that the Ministry never gave AECL any specific basis for approving or withholding agreement to proceed. In so doing, Ontario has been able to keep complete control of the pace and location of field work.

Community Approval Inadequate & Confused

With so much attention focussed on community approvals, one might have thought that this would be one area where the Committee would not find any serious difficulties. In fact, however, the most serious problems are in this very area. Major problems at the community level have created public confusion, a legacy of distrust and negative feelings about the program. There is confusion in the definition of community, in determining what constitutes community agreement and in the right of a community to veto proposed plans. These problems, outlined in greater detail below, are accentuated by the failures cited above of not specifying how key future phases of the program will proceed. As a result, there appears, at times, to be confusion in the minds of the public and even the involved agencies over the procedures and processes being used to select field research and general studies sites and those that may eventually be used to select a repository site.

Defining A Community

Field studies in the Precambrian Shield often will be carried out in remote parts of the Province. The two field study sites in operation, although not nearly as remote as they might have been, illustrate the difficulty in defining a community.

The research site at Forsberg Lake is in an unorganized territory west of the town of Atikokan. There is no municipal council encompassing the site and no permanent habitation within 10 miles of the site. Nevertheless, since the approvals procedure requires AECL to formally brief a local municipal council the Co-ordinating Committee decided to brief the nearest municipal council, in this case Atikokan. AECL conducted the briefing and actually sought and received a resolution from Council giving it permission to proceed, even though the site is outside the Atikokan town boundaries and that Council is not ordinarily asked by other organizations for permission to conduct drilling operations.

In the public hearings in Northwestern Ontario, the Committee learned that citizens living outside the Atikokan town boundaries and those on a nearby Indian reservation felt that they had at least an equal right to be sought out for permission to proceed. It is the view of some residents that a referendum should have been held to enable them to express their views directly.

The research site at White Lake on the other hand, is located on land belonging to Darling Township. Other township boundaries are within a few miles of the site. Here, quite naturally, AECL had to seek permission from the Township Council prior to beginning work at the site. Nearby Councils in McNab Township and in Bagot and Bythfield Township were only briefed on the proposed field work, but they felt they could have been equally involved. In fact, McNab Township passed a resolution opposing the research project.

Defining Community Agreement

The seven step approval process specifies that it is essential to ascertain the views of locally elected representatives: Federal Members of Parliament (M.P.s), Provincial Members of the Legislative Assembly (M.P.P.s), and representatives on municipal councils. Strangely though, the visits to M.P.s and M.P.P.s are carried out under the guise of "informational briefings" held privately in the Members' Offices. Select Committee Members who had been briefed were unaware that their questions and comments were being noted as indicative of "community approval."

Even if a locally elected representative knew that his or her opinion was a surrogate for community approval, it would still not be clear how this opinion would affect the ultimate decision to proceed through the subsequent approvals steps. The Ministry of Energy told the Committee that, while locally elected representatives are consulted, the Province does not feel bound by their views. The most definitive statement the Committee could glean was that only if there was "obvious" opposition in the community would the approval procedure be used to stop field studies. However, "obvious" community opposition is, as it turns out, something measured completely through the exercise of political judgement by the government.

Deciding On A Local Repository Site

Although site selection is not to proceed until the next phase of the program, the major issues - perhaps the main issues - raised in communities where field studies have been proposed concern the rights of the community when, or if, there is a proposal to site the final repository. Possibly because of the somewhat unique effort to get a favourable resolution from Council, each community appears to have linked field research to site selection even though field research only incidentally could lead to that or a nearby site being selected.

At its inception the program appeared to enshrine the right of any community to veto a proposed repository in its vicinity. On June, 1978, the Honourable Reuben Baetz, then Minister of Energy said

"The nuclear waste site would not be thrust on any community without full consultation and agreement with them."

On June, 1979, Dr. S.R. Hatcher, the head of the disposal research program and a Vice-President of AECL wrote to the communities near White Lake

"Recognizing the limitations of our (AECL's) authority ... Nothing other than this basic research will take place in the White Lake area or any other area without the consent and encouragement from the community involved."

These flat assurances may have been made in complete good faith at a time when it was expected that the concept would be and could be so thoroughly and convincingly documented that all but a very small minority would welcome the clean, local industry to their community. AECL still hold that view. However, the community difficulties created by the generic field research may have changed the view of other officials.

As early as January 4, 1979, the Co-ordinating Committee minutes record that a slide/tape presentation should say:

"The decision on where the disposal facility will be built will take into account the wishes of the local community as expressed through their elected representatives."

(emphasis added)

By 1980, even more cold realism was being applied. In February the Deputy Minister of Energy advised that "agreement" in the Minister's 1978 statement should be taken as:

"Agreement means whatever is appropriate at the time the decision has to be made."

The Honourable Robert Welch, the current Minister of Energy took it the final, and possibly inevitable, step. In March of this year he said:

"I am not aware of any decision...which has incorporated the right of veto."

The consensus of the Committee is that communities are not likely to easily accept the siting of what will be perceived as a garbage dump for frightening nuclear poisons. The waste must be disposed of. It must be disposed of safely and permanently. In the Committee's view, it is most likely that government will ultimately have to choose where the unpopular site will be located.

Information Program Needs Strength and Balance

AECL has devoted a good deal of time and attention to the dissemination of information on the program. Special attention has been paid to both the technical community and the general public. But, while the efforts are laudable, the Committee found there is still considerable room for improvement. The information program directed at the technical community has not wholly succeeded in stimulating informed comments and criticisms. The extensive public information program has not succeeded in giving the general public the impression that it is being fully informed.

The technical community has received a large amount of information from AECL primarily in the form of Technical Reports available in university libraries and from AECL directly. In the First Annual Report on the Canadian Nuclear Fuel Waste Management Program, AECL lists some ninety-three titles in its Technical Report series. Of possibly more significance has been AECL's efforts to involve directly more "outside" researchers than has typically been the practice in the nuclear industry. Other government agencies, industrial engineering and research firms, and university faculty are an integral part of the research program. And, through the Technical Advisory Committee each of the learned societies with a technical interest in the program are represented in an objective review of the research program and the scientific data being assembled. In December of each year, AECL submits a public annual review of the program. In June of this year the Technical Advisory Committee will publish the first of its annual reviews.

Information is being provided. The Committee's concern is that there is inadequate two-way communication. Two specifics are indicative of this concern. The first is that in publishing Technical Reports, AECL is too often by-passing the

open scientific literature and thereby missing the critical peer review process of having papers reviewed by technical experts. The second is that there has not been sufficient effort to conduct technical symposia where critical discussions can be encouraged. The Canadian Geoscience Council organized such a conference in October 1978. AECL attended and were active participants. The Committee agrees with the Canadian Geoscience Council that the organization of such conferences should not be left to the unplanned initiative of outside technical groups, but should be a responsibility of AECL.

Accordingly the Committee recommends that:

RECOMMENDATION III AECL SHOULD MORE ACTIVELY SEEK OUT THE INFORMED CRITICISM OF THE TECHNICAL COMMUNITY BY SUBMITTING MORE TECHNICAL PAPERS TO THE PEER REVIEW PROCESS OF THE SCIENTIFIC LITERATURE AND BY TAKING THE INITIATIVE IN SPONSORING TECHNICAL SYMPOSIA WHERE CRITICAL DISCUSSION IS ENCOURAGED

AECL has also made a concerted effort to keep the public informed about the program. Tens of thousands of information contacts have been made with the people of Ontario through booklets, newsletters, films, exhibits, a toll free information line, briefings and the reporting of the media. Despite the volume of available information, the Committee received ample indication that the public's information needs have not been adequately met.

In reaching this conclusion, the Committee is drawing heavily on information gathered from people living around the two sites where field work is ongoing. These people have probably received more information on waste disposal than any other community in the Province. Spokesmen from both communities remain dissatisfied.

* In the Atikokan area, even those who support the research drilling agreed with program critics that more public information and community involvement is needed.

* In the White Lake area, it appears that the contact AECL made with the public raised nothing but opposition to the research and distrust of AECL.

One of the major problems AECL must overcome is the public's perception that its entire program --- from basic research to public information --- is biased by its commitment to nuclear power and consequent desire to show that waste disposal is not an insuperable problem. The Committee's view is that AECL compounded its credibility problem by its one-sided, overly positive and broadly pro-nuclear presentations of information.

* In Atikokan, citizens were primarily concerned that there was no balance in the information they received.

* A Township Councillor near White Lake reported that he did not hear of any program weakness or uncertainty until he attended a special conference in Northern Ontario organized by citizens opposed to the program.

* An analysis by Committee staff of the "newsletters" sent out by AECL revealed that the "news" aspect of the mailing ignored almost everything negative about waste management (such as a petition opposed to research drilling signed by 16,000 people in Northwestern Ontario) and included generally pro-nuclear information and arguments that were unrelated to the specifics of the waste management program.

AECL conceded that the public information program has not been as successful as it would like it to be. It recognized that the ineffectiveness of the public information program is slowing the pace of the critical geological field research. The Committee considered several suggestions for improvement offered during the hearings, including using the expertise Ontario Hydro has developed in dealing with unpopular transmission line routings or the intermediary approach suggested by David Foster of Energy Pathways. Ontario Hydro has been relegated to a minor role by the Ministry of Energy's concern with keeping a low profile for the Province -- a concern that has kept AECL officials from the convenience of using Hydro regional offices, required Hydro to do minor field surveys in unmarked vans and delayed the publication of an Ontario Hydro Technical Report while officials discussed whether to delete Hydro's name from the report cover.

It is the view of the Committee that it is impossible for any public information program, no matter how well intentioned or conceived to be successful as long as the major program deficiencies outlined in this chapter remain uncorrected. The public information cannot provide answers to the questions the public is asking because the answers are not available.

- There are no criteria for judging whether proposed solutions are acceptable
- There is no established procedure for approving or rejecting proposals or determining when a phase of the program has been satisfactorily concluded
- There is no assurance that public hearings will be appropriately structured to facilitate the airing of local concerns
- There is no decision on the ultimate responsibility for proposing particular sites
- There is no agency given the responsibility for finding and operating the repository
- There is no officially accepted realistic program schedule

With so much uncertainty and so many critical questions left unanswered, even the best and most unbiased public information program is bound to appear weak and confused. It can only reflect the true state of the program.

CHAPTER 4

RECOMMENDATIONS FOR OVERALL CHANGE

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On March 13, 1980, the Hon. Robert Welch, Ontario Minister of Energy appeared before the Committee. At that hearing the Committee learned that the Minister intended to wait for the report of the Committee before discussing with Cabinet the further direction of the program and Ontario's place in it. The Committee understands that, in the context of further direction, a new agreement is to be negotiated with the federal government. The Committee welcomes this indication by Government that it already accepts that the direction of the program must be re-assessed. The Committee feels that substantial changes are absolutely required. The Committee is concerned that the current technical program will be continuously hampered and delayed by the public distrust that now surrounds it. Further, as the program is currently managed, there is very little chance that any technical solution - no matter how well conceived - will be publicly accepted.

The changes required are deep and fundamental. They fall into two broad categories. First, a new agency must be created to assume full public responsibility for managing the entire program from its current research phase through to the operation of the repository. Second, governments must agree on and inform the public of the procedure, basis and jurisdiction for approvals and public safeguards at all phases of the program. Each of these broad changes will be developed in more detail below.

CREATE A WASTE DISPOSAL AGENCY

One of the major gaps in the Canadian program is its failure to identify any agency or group as being clearly and visibly responsible for the entire program. The Ministry of Energy has taken the position that agreement on responsibilities is needed only for phase one, and that there is plenty of time to work out responsibility for subsequent phases. This approach is no longer adequate. Too many questions of concern to the public can and have been ignored. Some group must take responsibility now for proposing answers to key questions on site selection, demonstration and final operation.

It is worth noting that both Sweden and the U.S.A. have reached this same conclusion. In Sweden, a consortium of electric utilities assumed full responsibility for national waste management program. Until very recently the U.S.A. operated as Canada now does with various agencies involved, each with current responsibilities but under 'ad hoc' arrangements that might or might not be continued. After extensive review and commentary by technical and non-technical groups and individuals, President Carter recently announced that the Department of Energy is definitely and fully responsible for the complete waste management program. (In the U.S.A., this responsibility includes both spent fuel and high-level weapons wastes.)

As far back as 1977, the Hare Commission saw that the public would require a visible responsibility centre to relate to the entire program. It must be established as soon as possible.

Accordingly the Committee recommends that:

RECOMMENDATION IV THE GOVERNMENTS OF CANADA AND OF ONTARIO SHOULD ESTABLISH UNDER JOINT OWNERSHIP A NUCLEAR FUEL WASTE MANAGEMENT AGENCY THAT WOULD HAVE OVERALL RESPONSIBILITY FOR THE CANADIAN PROGRAM FROM THE RESEARCH PHASE THROUGH TO FULL COMMERCIAL OPERATION OF A REPOSITORY FOR HIGH LEVEL WASTES PRODUCED IN THE PROVINCE OF ONTARIO.

Given the nature of fuel waste management in Canada (especially the fact that it is virtually all produced in Ontario) the Committee agrees that the concept of shared responsibility underlying the Canada-Ontario Agreement and the equal representation on the Co-ordinating Committee should continue.

Accordingly the Committee recommends that;

RECOMMENDATION V THE NUCLEAR FUEL WASTE MANAGEMENT AGENCY SHOULD BE CONTROLLED BY A BOARD HALF OF WHOSE MEMBERS ARE SELECTED BY THE FEDERAL GOVERNMENT AND HALF BY THE ONTARIO GOVERNMENT.

The Committee envisages such an agency taking management responsibility for the entire program rather than necessarily taking operating control of each and every aspect. The agency would, therefore, likely contract with AECL for the management and conduct of the immobilization and disposal research program. It would provide the research objectives for AECL; AECL would use its expertise to plan and carry out the research activities.

One aspect of the research the agency could take unto itself is the active liaison with international programs in order to compare AECL proposals to those of other jurisdictions. In particular, the agency should take a very close look at work being done on alternative geological media (especially the soft rocks) and provide a focus for Canada's continuing involvement in the developments in deep ocean burial.

In order to assess the relevance to Ontario of international research on alternative media, it will be necessary to conduct the field studies necessary to learn the exact nature of the soft rocks in Ontario.

Accordingly the Committee recommends that:

RECOMMENDATION VI THE NUCLEAR FUEL WASTE MANAGEMENT AGENCY SHOULD BE GIVEN AUTHORITY TO CONDUCT SUCH FIELD STUDIES AS ARE NECESSARY TO CHARACTERIZE THE SOFT ROCKS AVAILABLE IN ONTARIO THAT MIGHT BE SUITABLE AS A WASTE REPOSITORY.

In addition to overseeing and, where necessary, carrying out research, the new agency should take responsibility for all subsequent phases. It should, for example, be prepared to set out for public review and approval the criteria that it expects a repository can satisfy. In other words, this agency should be able to be

specific in telling the public just how "safe" it expects a repository to be with government and regulators assessing the adequacy of its proposal.

The agency should also be able to set out, again for public comment, the timetable it is committed to meeting. If slippage occurs, the timetable may be altered, but the same agency must bear responsibility for the specificity implied in a definite plan.

Implied in the commentary above is the idea that this agency will have a public profile and a public responsibility. The agency will be responsible for conducting all public information programs, endeavouring to be as objective as it can. It should take up AECL's work in reporting annually on the program's progress, including an annual review of AECL's research activities as well as all other aspects of the program.

The agency will determine when, in its view, the research is sufficient to verify the concept. It will send out the necessary documentation, actively seek out comments and criticisms and be prepared to defend its judgement. Ultimately, it will be this agency that will propose and defend in a public hearing a specific solution to nuclear fuel waste management, including the preferred and alternate sites for the repository and the details of transportation and immobilization.

Finally this agency will develop, test and operate the repository according to regulatory licencing conditions.

It is vital to recognize that the creation of this 'super agency' is entirely dependent upon the full development of the regulatory process that follows. It must not be established unless it is balanced by an equally comprehensive system of public safeguards.

ENSURE FULL PUBLIC SAFEGUARDS

To date, public concerns about the direction of the program have been met with general assurances from responsible officials. The assurances have, of necessity, been vague rather than specific. Local communities are assured they will definitely be 'involved' in decisions on the location of a repository. But there is no definition of 'community' or of involvement. There are promises of full public hearings and regulatory safeguards. But the kind of hearing, the degree of public participation, even the jurisdiction responsible is not decided. The repository will be 'safe' and have an insignificant effect on human health and the environment. But there are still no criteria for objectively specifying 'how safe'. In the light of so much vagueness on the matters that are most important to the public, the Committee is not surprised that the public is not reassured by AECL's information program. Each area must be improved.

Workable Approach to Community Involvement

At this time the program does not have a clear basis for working with communities. There is a seven step process. There is a requirement for approvals each step of the way. There is not, however, any specific criteria that satisfactorily defines the requirements at each step. The definition of community needs to be revised:

- At the drill site near Atikokan, many people thought that a local plebiscite should have been used because there is no municipal government structure in an unorganized territory.
- At the research site at White Lake, councillors in nearby townships felt that they had an equal right to be involved.

And the meaning of community involvement and whether it carries the right to 'local veto' has never been clarified.

- For research sites, AECL reports the apparent concurrence of the elected federal and provincial representatives and seeks a municipal council resolution but it is not clear how governments weigh these expressions of local opinion.
- For final site selection, the procedure and basis of ultimate approval has never been finally determined.

The Committee believes very strongly that a straight-forward, workable approach to community involvement is required. The approach taken must be practical and workable without creating false expectations about the real power of local communities to override provincial or national interest.

In setting out a workable approach, the Committee has differentiated between the procedures and rights of communities when generic field research or general field studies, such as 'fly-overs' are involved and those when a site is being selected for demonstration as a final repository.

The Committee recommends that:

RECOMMENDATION VII FOR PURPOSES OF FIELD RESEARCH, COMMUNITY INVOLVEMENT SHOULD INCLUDE THOSE PEOPLE IN THE GEOGRAPHICAL AREA DIRECTLY AFFECTED BY THE RESEARCH WITHOUT SPECIFIC REGARD TO MUNICIPAL BOUNDARIES. THOSE PEOPLE SHOULD BE ASSURED THAT THEY WILL: BE FULLY INFORMED ABOUT THE EXACT NATURE OF THE WORK BEING UNDERTAKEN, INCLUDING ANY AND ALL RISKS ASSOCIATED WITH IT; HAVE AN OPPORTUNITY TO ASK QUESTIONS ON A REGULAR BASIS OF RESPONSIBLE OFFICIALS RELATING TO ANY ASPECT OF THE RESEARCH PROGRAM; HAVE AN OPPORTUNITY TO EXPRESS POINTS OF VIEW ABOUT DIRECT IMPACTS OF THE RESEARCH TO THE AGENCY RESPONSIBLE EITHER DIRECTLY OR THROUGH LOCAL REPRESENTATIVES.

RECOMMENDATION VIII IN THE SELECTION OF A SITE FOR DEMONSTRATION LEADING TO THE EMPLACEMENT OF NUCLEAR WASTES, COMMUNITY INVOLVEMENT SHOULD INCLUDE THOSE PEOPLE THAT FEEL AFFECTED BY THE DECISION. ALL CITIZENS SHOULD: HAVE THE RIGHT TO BE FULLY INFORMED ABOUT THE EXACT NATURE OF THE WASTE DISPOSAL PROGRAM INCLUDING ANY AND ALL RISKS ASSOCIATED WITH IT; HAVE AN OPPORTUNITY TO ASK

QUESTIONS ON A REGULAR BASIS OF RESPONSIBLE OFFICIALS RELATING TO ANY ASPECT OF THE ENTIRE PROGRAM; HAVE THE RIGHT TO EXPRESS POINTS OF VIEW TO AN INDEPENDENT DECISION-MAKING BODY RESPONSIBLE FOR PROTECTING PUBLIC HEALTH AND SAFETY. THE DECISION MAKING BODY WILL HOLD PUBLIC HEARINGS IN THE AREAS OF THE PROVINCE MOST DIRECTLY AFFECTED BY THE DEMONSTRATION AND OPERATION OF THE REPOSITORY.

Principles for Regulatory Approval

It is essential that the regulatory approval process be finalized very quickly. In its absence there can be no assurance to any individual or community that appropriate protection of the public interest will be safeguarded.

There are several jurisdictional approaches that could be taken to the regulatory process. In any circumstance, the Atomic Energy Control Act ensures that the AECB will be involved. But there could be some sharing of responsibility between the AECB and either the federal or provincial environmental agencies. (In the U.S.A., President Carter explicitly shared the regulatory responsibility between the Nuclear Regulatory Commission and the Federal Environmental Protection Agency.) Alternatively, Canada could work out a unique arrangement that might maintain the AECB jurisdiction but allow for a public hearing and recommendations through some mechanism of the Environmental Assessment Act. The Committee can see some merit in each approach but it is most concerned that there be no further delay in clarifying the process and in ensuring its adherence to certain principles.

Accordingly, in order to clarify the process the Committee recommends that:

RECOMMENDATION IX THE GOVERNMENTS OF CANADA AND ONTARIO ACCEPT THE URGENCY OF CLARIFYING RESPONSIBILITY FOR REGULATORY APPROVAL OF NUCLEAR FUEL WASTE MANAGEMENT.

While the Committee could consider several jurisdictional approaches, the Committee is most concerned that the approach chosen should adhere to certain, quite specific principles. The principles that concern the Committee will ensure that the public will be meaningfully involved and that, so far as is possible, the barriers that reduce public effectiveness in regulatory matters be eliminated.

Accordingly, the Committee recommends that:

RECOMMENDATION X THE HEARING PROCESS CHOSEN MUST ADHERE TO THE FOLLOWING PRINCIPLES OF: SEPARATE HEARINGS TO SET GUIDING CRITERIA AND TO ASSESS SPECIFIC PROPOSALS; FULLY PUBLIC HEARINGS IN ALL AFFECTED REGIONS; THE AVAILABILITY OF FUNDING TO ENSURE FULL PUBLIC INVOLVEMENT; A HEARING PROCESS AND BASIS FOR DECISION THAT TAKES INTO ACCOUNT ALL THE FACTORS A COMMUNITY WISHES TO RAISE; FINAL DECISION ON THE SITE BY RESPONSIBLE GOVERNMENTS ON THE RECOMMENDATION OF THE REGULATORY BODY.

Criteria in Advance of Proposals

Each of the American witnesses before the Committee pinpointed the lack of criteria for the acceptability of a proposal as the glaring weakness of the Canadian program. In the words of one, "developing a proposal without criteria is like drawing the target around a dart after it has been thrown." L. Charles Hebel, Manager of Research Planning for Xerox Corporation and Chairman of the American Physical Society - sponsored study concerning Nuclear Fuel Cycles and Waste Management pressed upon the Committee the need to have "more quantitative criteria - yardsticks - with which to measure progress..."

This does not mean that detailed technical criteria are required, or could even be developed at this time. Rather, what is needed is an overall guide to 'safe enough' that could help the public understand the nature of the risks if the program meets its objectives. During the hearing, several overall criteria were suggested, including:

- Emissions no greater than those of a typical Ontario uranium ore body, suggested by Dr. Shemilt of the AECL Technical Advisory Committee and by the U.S. based Natural Resources Defence Council
- Emissions within the normal variation of natural background radiation suggested by Charles Hebel
- No emissions in the first 1000 years and 1/100,000 of the available radionuclides thereafter, a proposal of the Nuclear Regulatory Commission
- A concept of measurably miniscule or insignificant in relation to known knowledge of radiation effects developed after discussion by the Technical Advisory Committee

The Committee is aware that the AECB is working on general guidelines and expects to be able to make them available to the public and the industry sometime this summer. This will be a major improvement to the current situations and is welcomed by the Committee. It will be important however that the AECB allow for meaningful discussion of its criteria by all interested parties, hold public hearings and be prepared to make changes if required.

Accordingly, the Committee recommends that:

RECOMMENDATION XI THE FIRST TASK OF THE ASSIGNED REGULATORY AUTHORITY SHOULD BE TO STIMULATE PUBLIC DISCUSSION OF OVERALL CRITERIA INCLUDING THE HOLDING OF A PUBLIC HEARING.

DISSENTS

JIM FOULDS, EVELYN GIGANTES, BOB MACKENZIE

**DISSENT OF THE FOLLOWING MEMBERS:
JIM FOULDS, EVELYN GIGANTES, BOB MACKENZIE**

The report of the majority of the Select Committee expresses very well the major elements of consideration and concern which marked the Committee's work in assessing the Canada-Ontario Nuclear Waste Disposal Program.

There are, however, two areas of Committee work which are inadequately represented in the majority report.

The first centres on the transportation of nuclear waste. The committee devoted much time and effort to the examination of current transport operations of nuclear material (including nuclear waste), and attempted to gain an understanding of the public risk implications of the greatly-increased number of waste shipments which will be a necessary concomitant of any centralized waste disposal program.

We found that public information programs by AECL do not accurately reflect existing transportation. Cobalt 60 is regularly shipped from Pickering to AECL's Kanata facilities (about 200 miles) in containers which do not meet the physical standards recommended by international bodies, or the standards implied by a film presentation which is employed by AECL and Ontario Hydro:

Mr. Mackenzie: I was just curious, on page two, the shipment of cobalt 60 from Pickering reactors to Chalk River is done in containers which fall just short of meeting the AEA standards, and thus of course you go into special administrative arrangements. What do you mean by just short on those containers?

Mr. Beare: Those flasks were subjected to the nine metre drop test on to the unyielding surface, and I should add also that another requirement of that drop test is that it be dropped with the flask in an attitude which is most likely to produce the most damage. This usually means a corner of an edge. It may have to be dropped upside down. There are special techniques for ensuring that the flask drops just the way you want it to drop.

In this particular case this is a flask that is filled with lead and it is steel-sheathed, and you rely on the integrity of the steel to retain the lead in the event that the temperatures in the fire test get up to the point of the melting point of lead. The lead, even though it is molten, would still provide good shielding.

In this particular case, when the package was dropped in the nine metre test a weld cracked and the testing was stopped at that point and it was conceded by the applicant that the flask probably wouldn't meet the specifications for the tests that would follow, the pin test and the fire test. So at that stage it was decided to implement a design change which would beef up the weak area of that flask. My latest information is that there will be a new design brought in and the flask will be built to the new design.

Mr. Mackenzie: How many dropping tests did this fail, just one?

Mr. Beare: Just one.

Mr. Mackenzie: Why would you say then it fell just short? It seems to me that if it failed on the first and only test I would be a little stronger in my wording than that.

Mr. Beare: The difference is that the flask didn't fall apart in the drop test, there was a crack in a weld. That's the reason I used the term "fell just short of it."

Ms. Gigantes: That's the flask that has 400,000 to 500,000 curies of radioactivity?

Mr. Beare: The maximum loading for that flask is 400,000 curies. I think most shipments run more in the order of 200,000 to 300,000"

J.W. Beare, Director Safeguards and Nuclear Materials Branch, Atomic Energy Control Board (Tue. Feb. 26, 1980).

Waste from the NPD reactor at Rolphton is also regularly shipped 29 miles to AECL's Chalk River facilities in containers which do not meet international "standards". The AECL licenses these shipments because special personnel are attached to each shipment and the routes are prescribed.

The current looseness in the regulation and practice of transportation of nuclear materials does not inspire confidence about the implications of a large increase in nuclear waste shipments; the agencies which ship this material, and the agency responsible for regulating the shipments (the AECB) must demonstrate a greater awareness of the need for public safety.

Furthermore, the accepted international "standards" for container integrity may not be adequate. The bus which carried members of the Select Committee from the Atikokan drill site to Thunder Bay (in heavy fog) was forced to stop at the roadside to permit passage of a large truck heavily loaded with big logs which was travelling in the opposite direction. Do international "standards" for container integrity meet this common Canadian test for risk protection?

"Ms. Gigantes: If we go, then, to looking at the transportation of spent fuel, we are talking about cask A or cask B containers.

Mr. Beare: You are talking about type B containers.

Ms. Gigantes: Type B; and if you have a type B container and you are on the road from Atikokan to Whiteshell and you run smack into a truck carrying two loads of logs, what would you figure the equivalent strain on the cask would be?

Mr. Beare: My guess is that it would be less than the drop from 30 metres on to an unyielding surface.

Ms. Gigantes: Has that ever been calculated?

Mr. Beare: No, and I think the calculation would depend more on the assumptions that you want to put, as to whether it is a head-on, or what kind of vehicles run into each other. I think so much depends on the specifics it would have to be a very precisely specified type of accident in order to be able to do a precise calculation.

Ms. Gigantes: It is probably one of the more likely accidents on that route?

Mr. Beare: That is quite likely, but even if the trucks run into each other at that speed, that doesn't mean that the flask is going to decelerate at that speed, and it is the rate at which the flask decelerates that determines the forces that are imposed on that flask, and therefore the stresses and strains that the material will see.

Ms. Gigantes: Yes.

Mr. Beare: You will probably find with trucks that hit head on that the ends will either slide around or flip up or something like that, and this tends to cushion the shock on the flask. It is not really great for the driver, of course.

Mr. Foulds: The logging truck scenario which Ms. Gigantes points out is one that will be increasingly common now that shipments through northwestern Ontario to Whiteshell have been increasing, since the Ontario/Canada agreement. Why haven't there been any specific engineering studies done of that particular accident, seeing as most of highway 17 and highway 11 in the north are often very well travelled by very heavily laden pulp trucks?....."

(Tuesday February 26, 1980) - J.W. Beare, Director
Safeguards and Nuclear Materials Branch - AECB.

The second area in which the majority report does not adequately reflect an important consideration in the work of the Committee is that there is no account of the concern of a number of witnesses for what might be termed a "community research guarantee".

The Canadian Geoscience Council presented the idea to us in its most authoritative form. In essence, it is as follows:

Research to test the deep-rock burial concept must be extensive. Communities are reluctant to accept research as research when there is no guarantee that a research site will not become a disposal site. Communities are not willing to accept a disposal site without extensive public hearings and, with no guarantee that a research site will not become a disposal site, communities will not accept research without extensive public hearings. This train of logic (which we have witnessed in both Ontario communities where research has occurred) can easily lead to a research program which grinds to a halt.

The proposal of the Geoscience Council was predicated on the judgement that if deep-rock waste burial can be scientifically evaluated as a safe disposal

method, it will be a method which can be used in many sites. For example, AECL has identified 1200 plutons in the Ontario Pre-Cambrian Shield which are considered promising subjects for assessment. Therefore, the Geoscience Council has proposed that the research program should be carried out in a framework in which communities which welcome research programs are guaranteed that research will not become a site selected for a repository.

Considering that many of the fears of the Geoscience Council concerning community resistance to research are now a matter of records, the proposal has much to recommend it. The scientists who are working on the waste disposal program view their research as generic, and are confident that it can lead to the transfer of scientific knowledge to one of many appropriate sites. Dr. Stan Hatcher, AECL's Director of the Waste Management Program, testified that the program could proceed under the proposed system of community "guarantee":

"Ms. Gigantes: I think that is something we have to address ourselves to and I will put to you my feeling, and I think it is shared by some of the members of the committee, perhaps all at this stage, that if the research program which is the foundation of the waste management program, is to proceed in an adequate fashion in Ontario, then it is going to be necessary to have a government guarantee that where the research occurs, site selection will not. I would like your reaction to that.

Dr. Hatcher: That is certainly a possibility governments might want to work out between themselves at the federal, provincial and local levels.

Ms. Gigantes: Could you operate under those conditions?

Dr. Hatcher: Yes, we could. It is not going to guarantee that AECL can operate that way.

Ms. Gigantes: I understand that. That is a political responsibility.

Dr. Hatcher: This situation came up in White Lake and I tried to deal with it at that point. It is not a guarantee that AECL can make. On the other hand, as we have tried to make very clear, I am sure there are a large number of areas where we could do the research. If governments want to negotiate some sorts of guarantees between themselves, that is certainly their prerogative. Provided, as a result of all that process, we can have a site which has the characteristics which will make a good, technical research program, then I have no difficulty with that.

Ms. Gigantes: Thank you very much....."

Dr. S.R. Hatcher, Director of Waste Management
Program - AECL - (Thursday, February 7, 1980).

Given such opinion, it is unfortunate that the majority of the Select Committee was unwilling to recognize the merit of recommending that communities which welcome research should receive a guarantee that the selection of a research site will not be transformed, after the event, into the selection of a disposal site.

Until such a policy has been adopted by federal and provincial governments, we feel that governments should recognize that local communities, including unorganized territories, should have veto authority over the final placement of any nuclear waste repository.

The Ontario government should be called upon to incorporate new policy on these two areas of concern into a revised Waste Management Program, even though they are not included as subjects or recommendations by the majority of the Select Committee.

APPENDIX A

TERMS OF REFERENCE

SELECT COMMITTEE ON ONTARIO HYDRO AFFAIRS

APPENDIX A

TERMS OF REFERENCE

On motion by Mr. Welch, seconded by Mr. Kerr,

ORDERED, That a Select Committee of the Legislature be appointed:

First, to inquire into the cost of construction of the two heavy-water plants being built by Ontario Hydro at the Bruce Nuclear Power Development, and report to the Legislature on all factors affecting cost, such examination to include but not be limited to:

- (a) The requirements for heavy water, the original estimates of the cost of the plants and the contract signed with the Lummus Company of Canada for the construction of the plants and the conditions placed on the contracts for Canadian content;
- (b) The change in the scope of the work required due to changes in plant design after the original estimates were completed;
- (c) The effect on the total cost of the plants and their construction schedule due to the cancellation of the fourth plant known as plant "C";
- (d) The factors affecting any additional costs incurred by the contractor and Hydro for the supply of major equipment, structural components or other supply items;
- (e) The factors affecting escalation of sub-contracts placed by the contractor, or Hydro for work related to the construction of the plants;
- (f) The factor affecting labour costs for construction of the plant including escalation of labour rates, work stoppages, union jurisdictional disputes, and the shortage of any labour skills required for construction;
- (g) The effect of interest rates, and foreign exchange rates on the overall costs of construction;
- (h) The administration of the contract by Hydro and the control methods used to monitor and minimize the cost,

and to prepare and submit a report for the Legislature upon the conclusions of this inquiry.

Second, to review the implementation of the recommendations of the Select Committee of the 30th Parliament which examined Ontario Hydro's proposals for bulk power rate increases for 1976; such review to include consideration of Ontario Hydro's status reports tabled by the Ministry of Energy.

Third, to examine Ontario's nuclear commitment, taking into account the report and recommendations of the Royal Commission on Electrical Power Planning and Ontario's Energy Future, such examination to include but not be limited to:

- (a) Ontario Hydro's system planning strategy for adopting nuclear power and, in particular:
 - o Large v. small generating stations;
 - o Remote stations v. sites close to urban areas;
 - o The ratio of nuclear-fuelled generating stations that should be built in comparison to fossil fuelled stations, keeping in mind security of supply and cost differentials;
- (b) The economics of nuclear power v. generation from other primary fuels;
- (c) The performance and reliability of nuclear generating stations;
- (d) The responsibility for, and the standards relative to the safety of nuclear generation stations;
- (e) Environmental impact and health considerations related to nuclear power.

And that the Select Committee may prepare and submit interim reports for the Legislature and shall prepare and submit a final report before the end of December, 1978, and that the Select Committee may request such coverage of its proceedings by Hansard and the printing of such papers as the Committee deems appropriate; and the Committee shall have authority to sit during the interval between sessions and have full power and authority to employ counsel and such other personnel as may be deemed advisable and to call for persons, papers and things, and to examine witnesses under oath and the Assembly doth command and compel attendance before the said Select Committee of such persons and the production of such papers and things as the Committee may deem necessary for any of its proceedings and deliberations, for which the Honourable Speaker may issue his warrant or warrants; and the Committee shall be composed of 14 members as follows: Mr. MacDonald (Chairman), Ashe, Foulds, Gigantes, Haggerty, Handleman, Jones, Kerrio, Lane, Leluk, Nixon, Reed (Halton-Burlington), Samis, and Williams*.

Messrs. Handleman, Jones, Kerrio, Lane, Samis and Nixon were subsequently

* - replaced by Messrs. Belanger, Cureatz, Conway, Hennessy, Mackenzie, and Kerrio.

APPENDIX B

INTERIM REPORT TO THE LEGISLATURE, NOVEMBER 1978



APPENDIX B

THE SELECT COMMITTEE ON ONTARIO HYDRO AFFAIRS

INTERIM REPORT TO THE LEGISLATURE

The Legislative Assembly of the Province of Ontario

SECOND SESSION: THIRTY-FIRST PARLIAMENT

NOVEMBER 1978

THE SELECT COMMITTEE ON ONTARIO HYDRO AFFAIRS

INTERIM REPORT TO THE LEGISLATURE

THE LEGISLATIVE ASSEMBLY OF ONTARIO

SECOND SESSION: THIRTY-FIRST PARLIAMENT

MEMBERS


DONALD C. MacDONALD, M.P.P., Chairman	York South
ROBERT F. NIXON, M.P.P., Vice-Chairman	Brant-Oxford-Norfolk
GEORGE ASHE, M.P.P.	Durham West
J. ALBERT BELANGER, M.P.P.	Prescott-Russell
IAN DEANS, M.P.P.	Wentworth
JIM FOULDS, M.P.P.	Port Arthur
EVELYN GIGANTES, M.P.P.	Carleton East
RAY HAGGERTY, M.P.P.	Erie
MICKEY HENNESSY, M.P.P.	Fort William
VINCE KERRIO, M.P.P.	Niagara Falls
NICK LELUK, M.P.P.	York West
RON McNEIL, M.P.P.	Elgin
JULIAN REED, M.P.P.	Halton-Burlington
JOHN WILLIAMS, M.P.P.	Oriole

Counsel:	Alan M. Schwartz	Siegal, Fogler, Barristers and Solicitors
Consultant:	James D. Fisher	The Canada Consulting Group Management Consultants
Clerk of the Committee:	Andrew Richardson	
Assistant to the Clerk:	James Stesky	

TO: THE HONOURABLE J.E. STOKES
Speaker of the Legislative Assembly of the Province of Ontario

Sir:

We, the undersigned members of the Committee appointed by the Legislative Assembly of the Province of Ontario on November 24, 1977,* to inquire into various matters relating to Ontario Hydro, have the honour to submit the attached report.



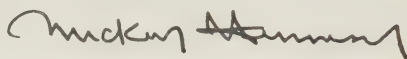
Donald C. MacDonald, M.P.P.
York South
Chairman



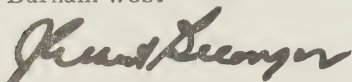
Robert F. Nixon, M.P.P.
Brant-Oxford-Norfolk
Vice Chairman



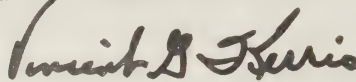
George Ashe, M.P.P.
Durham West



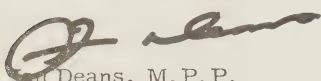
Mickey Hennessy, M.P.P.
Fort William



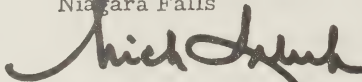
J. Albert Belanger, M.P.P.
Prescott-Russell



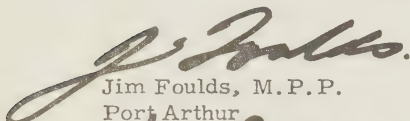
Vince Kerrio, M.P.P.
Niagara Falls



Ed Deans, M.P.P.
Wentworth



Nick Leluk, M.P.P.
York West



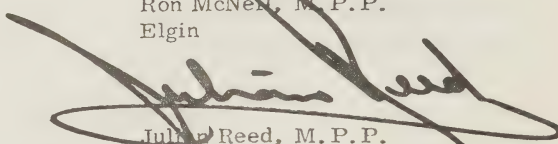
Jim Foulds, M.P.P.
Port Arthur



Ron McNeil, M.P.P.
Elgin



Evelyn Gigantes, M.P.P.
Carleton East



Julian Reed, M.P.P.
Halton-Burlington



Ray Haggerty, M.P.P.
Erie



John Williams, M.P.P.
Orillia

* - Prior to the commencement of the inquiry into the construction of the heavy water plants, Messrs. Deans and Hennessy replaced Messrs. Jones and Samis.

THE SELECT COMMITTEE ON ONTARIO HYDRO AFFAIRS
THE LEGISLATIVE ASSEMBLY OF THE PROVINCE OF ONTARIO
INTERIM REPORT TO THE LEGISLATURE

The purposes of this interim report are to bring the Assembly up to date on the work of the Committee and to request an extension of the Committee's term to permit the completion of its terms of reference.

The Committee has had a busy and productive year since its inception November 24, 1977. It studied proposed contracts between Ontario Hydro and two uranium producers during the January/February recess of the Assembly and submitted a report to the Legislature in March. Over the summer recess, it examined the construction of heavy water plants at Bruce and tabled a report with recommendations in the Legislative Assembly in October. And, it began examination of Ontario's nuclear commitment, with seven days of hearings on the management of nuclear wastes, within a week of receiving the interim report of the Royal Commission on Electric Power Planning and Ontario's Energy Future. Now, the Committee has two of its terms of reference to complete.

In the first two weeks of October, the Committee began its examination of Ontario's nuclear commitment (the third of the Committee's terms of reference) with an overview of the progress, responsibilities and concerns in the management of the various irradiated wastes of the nuclear fuel cycle. The Committee heard from a range of people representing a variety of view points on nuclear power in general and the management of irradiated wastes in particular. The sequence of the hearings, including a list of witnesses who appeared before the Committee, are Appendix A to this report. Generally, the Committee heard from both proponents and opponents of nuclear power, from technically knowledgeable experts and generally informed citizens. The Committee was given an introduction to the effects of radiation on human health, and a tour of a nuclear generating station that concentrated on the systems for handling irradiated wastes.

The Committee is impressed with the complexity and seriousness of the nuclear issues and does not intend, at this time, to take a position on any of them. There are, however, some general observations that the Committee can make.

§ First, Ontario's commitment to nuclear power commits this Province to the management of very dangerous poisons produced at several stages in the process of taking uranium from the ground and converting it to electricity for our homes, schools and factories. The most dangerous of these poisons are in the mill tailings (the residue of the process that turns mined uranium ore into a more concentrated form) and the spent fuels from the reactor. In the case of mill tailings, it is a problem of handling enormous volumes of low level or dilute poisons, while in the case of spent fuels, it is a problem of handling quite small quantities of very high level or concentrated poisons. Ontario's future involvement in the uranium industry and its commitment to nuclear power is critically dependent on achieving safe management of these dangerous substances

§ Second, there is a range of views, debated with great intensity, on every aspect of the nuclear cycle. There is disagreement on the level of radiation that is harmful. There is disagreement on the requirements for demonstrating the safety of the various nuclear operations. There is disagreement on the risks of the various nuclear operations. This Committee will have to make choices from among a variety of strongly held views

§ Third, choices are comparative not absolute. Neither proponents nor opponents of nuclear power can make absolute statements about safety or health effects. Both reach conclusions based on their own view of "acceptable" levels of risk. Proponents cannot say that nuclear stations are perfectly safe, only that they are safer than other industrial plants and processes. Opponents cannot point to specific hazards or cite numerous disasters, but can say only that there are too many risks and uncertainties.

The uncompleted terms of reference in full are Appendix B to this report. In general they are: to review the implementation of the recommendations of the Select Committee of the 30th Parliament which investigated various aspects of Ontario Hydro; and, to examine Ontario's nuclear commitment. Both are important tasks. Follow-up on recommendations of the earlier Select Committee, most of which were accepted

by the Government and Legislature, is needed to ensure that agencies are responsive to the direction of elected members. Examination of Ontario's nuclear commitment is needed because of the concerns of some members of the public about the safety of nuclear power and because Ontario's massive financial commitment to nuclear power has become a major element in the province's energy future. The Committee recommends that its term be extended to permit the completion of this important work.

APPENDIX A

SEQUENCE OF HEARINGS AND LIST OF WITNESSES

October 3rd - October 12th

- October 3 Committee Session
- October 4 - Dr. Jack Cunningham, Clinical Physics Department,
Princess Margaret Hospital, Toronto
- Dr. Peter Dynes, Office of Energy Research and Development
Department of Energy, Mines and Resources,
Ottawa
- October 5 From Ontario Hydro
- W.G. Morison, Director, Design and Development Division
- R. Wilson, Director, Health and Safety
- H. Irvine, Manager, Nuclear Systems
- October 10 From Atomic Energy of Canada Limited
Whiteshell Nuclear Research Establishment
Pinawa, Manitoba:
- Dr. S.R. Hatcher, Vice-President
- Dr. D.R. McLean, Head, Chemical Technology Branch
- Dr. T.E. Rummery, Head, Research Chemistry Branch
- Dr. H.Y. Tammemagi, Geological Disposal of Nuclear Wastes
- October 11 - D. Foster, Member, Renfrew County Citizens for Nuclear
Responsibility
- P. Warrian, Research Director, United Steelworkers of
America
From Association of Women Electors of Kingston Area:
- Mrs. P. Hodge, Vice-President
- Mrs. E. Neave
- October 12 From Canadian Coalition for Nuclear Responsibility
- Dr. G. Edwards, Chairman
From Canadian Nuclear Association
- J.M. Douglas, Consultant, Cambridge, Ontario
- J.A. Weller, General Manager, Canadian Nuclear Association
- A. Wyatt, Vice-President, Canatom (Ontario) Limited

APPENDIX B

TERMS OF REFERENCE

TO BE COMPLETED

Second, to review the implementation of the recommendations of the Select Committee of the 30th Parliament which examined Ontario Hydro's proposals for bulk power rate increases for 1976; such review to include consideration of Ontario Hydro's status reports tabled by the Ministry of Energy.

Third, to examine Ontario's nuclear commitment, taking into account the report and recommendations of the Royal Commission on Electric Power Planning and Ontario's Energy Future, such examination to include but not be limited to:

- (a) Ontario Hydro's system planning strategy for adopting nuclear power and, in particular:
 - Large v. small generating stations;
 - Remote stations v. sites close to urban areas;
 - The ratio of nuclear-fueled generating stations that should be built in comparison to fossil fueled stations, keeping in mind security of supply and cost differentials
- (b) The economics of nuclear power v. generation from other primary fuels;
- (c) The performance and reliability of nuclear generating stations;
- (d) The responsibility for, and the standards relative to the safety of nuclear generating stations;
- (e) Environmental impact and health considerations related to nuclear power.

APPENDIX C

CHRONOLOGY OF THE RECORD OF HEARINGS INTO THE MANAGEMENT OF NUCLEAR FUEL WASTE IN ONTARIO

APPENDIX C

CHRONOLOGY OF THE RECORD OF HEARINGS INTO THE MANAGEMENT OF NUCLEAR FUEL WASTE IN ONTARIO

<u>Date of Meeting</u>	<u>Name of Organization and Personnel Representatives</u>
October 3, 1978	Committee Meeting with Staff and Members
October 4, 1978	Princess Margaret Hospital, Toronto Cunningham, Dr. Jack, Clinical Physics Department Department of Energy, Mines and Resources, Ottawa Dynes, Dr. Peter, Office of Energy Research and Development
October 5, 1978	Ontario Hydro Morison, W.G., Director Design and Development Division Wilson, R., Director Health and Safety Division Irvine, H.S., Group Manager (Nuclear) Design and Development Division
October 10, 1978	Atomic Energy of Canada Limited (AECL) Hatcher, Dr. S.R., Vice-President & General Manager Whiteshell Nuclear Research Establishment McLean, Dr. D.R., Head Chemical Technology Branch Whiteshell Nuclear Research Establishment Rummery, Dr. T.E., Head Research Chemistry Branch Whiteshell Nuclear Research Establishment Tammemagi, Dr. H.Y., Geophysicist, Head of Geotechnical Research Section Whiteshell Nuclear Research Establishment

<u>Date of Meeting</u>	<u>Name of Organization and Personnel Representatives</u>
October 11, 1978	Renfrew County Citizens for Nuclear Responsibility Foster, D., Spokesman United Steelworkers of America Warrian, P., Research Director Association of Women Electors of Kingston Area Hodge, Mrs. P., Vice-President Neave, Mrs. E.
October 12, 1978	Canadian Coalition for Nuclear Responsibility Edwards, Dr. G., National Chairman Canadian Nuclear Association Douglas, J.M., Consultant (Cambridge, Ontario) Weller, J.A., General Manager Wyatt, A., Vice President, Canatom (Ontario) Limited
January 8, 1980	Ministry of Energy Rowan, Malcolm, Deputy Minister
January 9, 1980	Atomic Energy of Canada Limited Hatcher, Dr. S.R., Vice-President & General Manager, Whiteshell Nuclear Research Establishment Tammemagi, Dr. H.Y., Geophysicist, Head of Geotechnical Research Section Whiteshell Nuclear Research Establishment Ontario Hydro Irvine, H.S., Group Manager (Nuclear) Design & Development Division Drolet, Dr. T.S., Manager, Nuclear Materials Management Department

<u>Date of Meeting</u>	<u>Name of Organization and Personnel Representatives</u>
January 10, 1980	Atomic Energy Control Board Smythe, W.D., Director, Fuel Cycle Branch Henry, Dr. L.C., Manager, Waste Management Division Canadian Coalition for Nuclear Responsibility Edwards, Dr. Gordon, National Chairman
January 15, 1980	Public Meeting - Atikokan, Ontario <u>Reeve of Atikokan</u> Pierce, Jack <u>Ontario Municipal Electrical Association, District #3</u> Calder, Webb, Chairman <u>Atikokan Chamber of Commerce</u> Nephen, Ken <u>United Steel Workers of America</u> Sheppard, Moe <u>Atikokan Citizens for Nuclear Responsibility</u> MacIntosh, Cliff Meyata, Bettina Nelson, Marie <u>Citizens presenting briefs</u> Mr. Jon Nelson Mr. Dick Hiner Ms. Debbie Haggerty Mr. Iain Angus Mr. Michael Lewis Mr. Henri Garreau Mr. Alex O'Neil <u>Member of Parliament (Federal) for Thunder Bay-Atikokan</u> McRae, Paul, M.P.

Date of Meeting

Name of Organization and Personnel Representatives

Member of Parliament (Ontario) for
Rainy River District

Reid, Patrick T., M.P.P.

January 16, 1980

Meeting with Thunder Bay City Council

Miller, Dusty - Mayor
Van der Wees, J.C.
Murray, R.
Willoughby, D.L.
Polhill, J.D.
Ubraico, R.
Packota, J.P.

Public Meeting - Thunder Bay, Ontario

Citizens Committee Studying Nuclear Waste
Thunder Bay

Mr. Peter Lang
Mrs. Prue Morton
Mr. Bruce McKay
Mr. Graham Saunders
Mr. William V. Roberts

Kenora Energy Group

Ms. Wendy Anthony

Grand Council Treaty No. 3

Copenace, Sam, Treaty Research Director

Environment North

Ms. Susan Snowden

Algoma Coalition for Nuclear Responsibility

Mr. Norm Sloan

Ignace Chamber of Commerce

M.A. Zoppitelli
David Martin
Robert O'Neil
Rodney Brown

Date of Meeting

Name of Organization and Personnel Representatives

Aldermen (Thunder Bay)

Roy Murray
John P. Packota

Citizens presenting briefs

Estella Howard, on behalf of
Gert Beadle
Mrs. C. Kafftan
Joan Kurisko
Angus Corey
Dianne Robinson
Nora Ronis
Ken Moffatt
Iain Angus

January 17, 1980

**Meeting at Whiteshell Nuclear Research Establishment
Pinawa, Manitoba**

Atomic Energy of Canada Limited

Hatcher, Dr. S.R., Vice-President & General Manager
Whiteshell Nuclear Research Establishment

Rummary, Dr. T.E., Director
Waste Management Division
Whiteshell Nuclear Research Establishment

Boulton, John, Assistant to the Vice-President,
Whiteshell Nuclear Research Establishment

Strathdee, Graham, Head,
Waste Immobilization Section
Whiteshell Nuclear Research Establishment

Tait, John,
Waste Immobilization Section
Whiteshell Nuclear Research Establishment

Vandergraaf, T.T.,
Sorption Research,
Storage & Disposal
Whiteshell Nuclear Research Establishment

Ohta, M.M., Head
Design & Project Engineering Section,
Whiteshell Nuclear Research Establishment

Date of Meeting

Name of Organization and Personnel Representatives

Guthrie, J.E.,
Environmental Research,
Whiteshell Nuclear Research Establishment

Tammemagi, Dr. H.Y., Head,
Storage & Disposal
Whiteshell Nuclear Research Establishment

Dugal, John,
Environmental Research
Whiteshell Nuclear Research Establishment

Lajtai, E.,
Storage & Disposal
(visiting Scientist from U of N.B.)
Whiteshell Nuclear Research Establishment

Doern, F.,
Analytical Science Section,
Research Technology
Whiteshell Nuclear Research Establishment

Cameron, Dr. D.J., Head
Fuel Immobilization Section
Chemical Technology Branch
Whiteshell Nuclear Research Establishment

Sargent, F.P., Head
Applied Chemistry
Research Section
Whiteshell Nuclear Research Establishment

Nuttall, Keith,
Chemical Technologist
Whiteshell Nuclear Research Establishment

January 22, 1980

Atomic Energy of Canada Limited

Hatcher, Dr. S.R., Vice-President & General Manager
Whiteshell Nuclear Research Establishment

Rummary, Dr. T.E., Director,
Waste Management Division
Whiteshell Nuclear Research Establishment

Tammemagi, Dr. H.Y., Head,
Geotechnical Research Section
Whiteshell Nuclear Research Establishment

<u>Date of Meeting</u>	<u>Name of Organization and Personnel Representatives</u>
	Cameron, Dr. D.J., Head Fuel Immobilization Section Chemical Technology Branch Whiteshell Nuclear Research Establishment
	Lyon, R.B., Storage & Disposal Waste Management Division Whiteshell Nuclear Research Establishment
January 23, 1980	Energy Pathways Foster, David, Policy Research Group Atomic Energy of Canada Limited Hatcher, Dr. S.R., Vice-President & General Manager Whiteshell Nuclear Research Establishment
January 24, 1980	Canadian Geoscience Council Strangway, Dr. D., President Chairman-Department of Geology University of Toronto Barnes, Dr. C.R., Immediate Past President Chairman-Department of Geology University of Waterloo Cherry, Dr. J., Professor-Department of Earth Sciences University of Waterloo Gale, Dr. J., Professor-Department of Earth Sciences University of Waterloo
January 29, 1980	National Resources Defence Council, Washington, D.C. Cochran, Dr. T.B., Senior Staff Scientist
January 30, 1980	Environmental Policy Centre, Washington, D.C. Berick, David, Washington Representative

<u>Date of Meeting</u>	<u>Name of Organization and Personnel Representatives</u>
	United States Department of Energy Heath, Dr. Colin, Director of the Division of Isolation
January 31, 1980	Lawrence-Livermore National Laboratory, University of California Cohen, Dr. Jerry J., Staff Scientist South Carolina Energy Research Institute Maxey, Dr. Margaret, Assistant Director
February 5, 1980	California Energy Commission — Nuclear Fuel Cycle Committee Varanini, Dr. Emilio, Commissioner and Presiding Member Technical Advisory Committee to Atomic Energy of Canada Limited on The Nuclear Fuel Waste Management Program Shemilt, Dr. L.W., Chairman Whitmore, Dr. G.F., Member Citizens' Committee Studying Nuclear Waste Saunders, Graham, Spokesman
February 6, 1980	American Physical Society Hebel, Charles L., Chairman of the American Physical Society - Study on Nuclear Fuel Cycles and Waste Management (Manager of Research Planning for Xerox Corporation) Ministry of Energy Rowan, Malcolm, Deputy Minister

<u>Date of Meeting</u>	<u>Name of Organization and Personnel Representatives</u>
February 7, 1980	Ministry of Energy Rowan, Malcolm, Deputy Minister Atomic Energy of Canada Limited Hatcher, Dr. S.R., Vice-President & General Manager Whiteshell Nuclear Research Establishment
February 26, 1980	Atomic Energy Control Board Beare, J.W., Director Safeguards and Nuclear Material Branch Atomic Energy of Canada Limited Hatcher, Dr. S.R., Vice-President & General Manager Whiteshell Nuclear Research Establishment
February 27, 1980	Renfrew County Citizens for Nuclear Responsibility Cowan, Tony, Spokesman Birkett, Ken, Spokesman McDermott, L., Councillor, Township of Lavant, Dalhousie and North Sherbrooke
March 13, 1980	Ministry of Energy Welch, The Honourable R., Minister
March 27, 1980	Committee Meeting with Staff and Members
May 15, 1980	Committee Meeting with Staff and Members
May 28, 1980	Committee Meeting with Staff and Members
June 4, 1980	Committee Meeting with Staff and Members

APPENDIX D

**LIST OF WITNESSES APPEARING BEFORE THE SELECT COMMITTEE ON
ONTARIO HYDRO AFFAIRS**

APPENDIX D

LIST OF WITNESSES APPEARING BEFORE THE SELECT COMMITTEE ON ONTARIO HYDRO AFFAIRS

Ministry of Energy

THE HON. R. WELCH	Minister
MALCOLM ROWAN	Deputy Minister

Ontario Hydro

W.G. MORISON	Director Design and Development Division
H.S. IRVINE	Group Manager (Nuclear) Design and Development Division
R. WILSON	Director Health and Safety Division
DR. T.S. DROLET	Manager Nuclear Materials Management Department

Department of Energy Mines & Resources, Ottawa

DR. PETER DYNES	Office of Energy Research and Development
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Atomic Energy of Canada Limited

DR. S.R. HATCHER	Vice-President & General Manager Whiteshell Nuclear Research Establishment
DR. H.Y. TAMMEMAGI	Geophysicist Head of Geotechnical Research Section Whiteshell Nuclear Research Establishment
DR. T.E. RUMMERY	Director Waste Management Division Whiteshell Nuclear Research Establishment
DR. D.R. MCLEAN	Head Chemical Technology Branch Whiteshell Nuclear Research Establishment
MR. JOHN BOULTON	Assistant to the Vice-President Whiteshell Nuclear Research Establishment

MR. GRAHAM STRATHDEE	Head Waste Immobilization Section Whiteshell Nuclear Research Establishment
MR. JOHN TAIT	Waste Immobilization Section Whiteshell Nuclear Research Establishment
MR. T.T. VANDERGRAAF	Sorption Research Storage and Disposal Whiteshell Nuclear Research Establishment
MR. M.M. OHTA	Head Design and Project Engineering Section Whiteshell Nuclear Research Establishment
MR. J.E. GUTHRIE	Environmental Research Whiteshell Nuclear Research Establishment
MR. JOHN DUGAL	Environmental Research Whiteshell Nuclear Research Establishment
MR. E. LAJTAI	Storage and Disposal (visiting Scientist from U. of N.B.) Whiteshell Nuclear Research Establishment
MR. F. DOERN	Analytical Science Section Research Technology Whiteshell Nuclear Research Establishment
DR. D.J. CAMERON	Head Fuel Immobilization Section Chemical Technology Branch Whiteshell Nuclear Research Establishment
MR. F.P. SARGENT	Head Applied Chemistry Research Section Whiteshell Nuclear Research Establishment
MR. KEITH NUTTALL	Chemical Technologist Whiteshell Nuclear Research Establishment
MR. R.B. LYON	Storage and Disposal Waste Management Division Whiteshell Nuclear Research Establishment

**Technical Advisory Committee to Atomic Energy of Canada Limited
on The Nuclear Fuel Waste Management Program**

DR. L.W. SHEMILT	Chairman
DR. G.F. WHITMORE	Member

Atomic Energy Control Board

J.W. BEARE	Director Safeguards and Nuclear Material Branch
W.D. SMYTHE	Director Fuel Cycle Branch
DR. L.C. HENRY	Manager Waste Management Division

Canadian Geoscience Council

DR. D. STRANGWAY	President (Chairman-Department of Geology, University of Toronto)
DR. C.R. BARNES	Immediate Past President (Chairman-Department of Geology University of Waterloo)
DR. J. CHERRY	(Professor-Department of Earth Sciences University of Waterloo)
DR. J. GALE	(Professor-Department of Earth Sciences University of Waterloo)

Canadian Nuclear Association

J.M. DOUGLAS	Consultant Cambridge, Ontario
J.A. WELLER	General Manager
A. WYATT	Vice-President (Canatom (Ontario) Limited)

Other Witnesses -- (in alphabetical order)

Algoma Coalition for Nuclear Responsibility

Mr. Norm Sloan

Association of Women Electors of Kingston Area

Mrs. P. Hodge, Vice President
Mrs. E. Neave

Atikokan Citizens for Nuclear Responsibility

Cliff MacIntosh
Bettina Meyata
Marie Nelson

Canadian Coalition for Nuclear Responsibility

Dr. Gordon Edwards
National Chairman

Citizens Committee Studying Nuclear Waste, Thunder Bay

Mr. Peter Lang
Mr. Bruce McKay
Mrs. Prue Morton
Mr. William V. Roberts
Mr. Graham Saunders

Energy Pathways

Mr. David Foster
Policy Research Group

Environment North

Ms. Susan Snowden

Grand Council Treaty No. 3

Sam Copenace
Treaty Research Director

Ignace Chamber of Commerce

Rodney Brown
David Martin
Robert O'Neil
M.A. Zoppitelli

Kenora Energy Group

Ms. Wendy Anthony

Member of Parliament (Federal) for Thunder Bay-Atikokan

Mr. Paul McRae, M.P.

Member of Parliament (Ontario) for Rainy River District

T. Patrick Reid, M.P.P.

Ontario Municipal Electrical Association, District #3

Webb Calder
Chairman

Princess Margaret Hospital, Toronto

Dr. Jack Cunningham
Clinical Physics Department

Renfrew County Citizens for Nuclear Responsibility

Ken Birkett, Spokesman
Tony Cowan, Spokesman
D. Foster, Spokesman
L. McDermott, Councillor
Township of Lavant,
Dalhousie
and North Sherbrooke

Town of Atikokan

Jack Pierce - Reeve
Ken Nephen - Atikokan Chamber of Commerce

Town of Thunder Bay

Dusty Miller, Mayor
R. Murray - Alderman
J.P. Packota - Alderman
J.D. Polhill - Alderman
R. Ubraico - Alderman
J.C. Van der Wees - Alderman
D.L. Willoughby - Alderman

United Steel Workers of America

Moe Sheppard
P. Warrian, Research Director

Private Citizens Appearing as Witnesses -- in alphabetical order

Mr. Iain Angus
Mr. Angus Corey
Mr. Henri Garreau
Ms. Debbie Haggerty
Mr. Dick Hiner
Ms. Estella Howard (on behalf of Gert Beadle)
Mrs. C. Kafftan
Ms. Joan Kurisko
Mr. Michael Lewis
Mr. Ken Moffatt
Mr. Jon Nelson
Mr. Alex O'Neil
Ms. Dianne Robinson
Ms. Nora Ronis

Witnesses appearing from the United States of America
-- in alphabetical order

American Physical Society
- Study on Nuclear Fuel Cycles and Waste Management

Charles L. Hebel, Chairman
(Manager of Research Planning
for Xerox Corporation

California Energy Commission — Nuclear Fuel Cycle Committee

Dr. Emilio Varanini
Commissioner and Presiding Member

Environmental Policy Centre, Washington, D.C.

David Berick
Washington Representative

Lawrence-Livermore National Laboratory, University of California

Dr. Jerry J. Cohen
Staff Scientist

National Resources Defence Council, Washington, D.C.

Dr. T.B. Cochran
Senior Staff Scientist

South Carolina Energy Research Institute

Dr. Margaret Maxey
Assistant Director

United States Department of Energy

Dr. Colin Heath
Director of the Division of Isolation

APPENDIX E

LIST OF EXHIBITS TABLED IN MEETINGS FROM OCTOBER 3, 1978 TO
JUNE 4, 1980

APPENDIX E

LIST OF EXHIBITS TABLED IN MEETINGS FROM OCTOBER 3, 1978 to JUNE 4, 1980

Exhibit #	Title	Date Tabled
C-1	Introducing the Nuclear Debate. Staff preview to the October Hearings on Nuclear Waste, October 3, 1978	October 3, 1978
C-2	Effects of Radiation - Dr. Jack Cunningham	October 4, 1978
C-3	Ontario Hydro Radioactive Materials Management An Overview Statement to the Select Committee of the Legislature by W.G. Morison, Director, Design and Development Division	October 4, 1978
C-4	A Layman's Guide to Nuclear Waste Management by Peter J. Dyne, Office of Energy P. & D., Energy, Mines and Resources, Ottawa October 2, 1978	October 4, 1978
C-5	Table 50 Estimated Effect of 1 Rad Per Generation of Low-Dose, Low-Dose Rate, Low-LET Irradiation on a Population of One Million Live-Born Individuals	October 11, 1978
C-6	"A Race Against Time" Interim Report on Nuclear Power in Ontario of the Royal Commission on Electric Power Planning	October 11, 1978
C-7	An AECL Report on the "Management of Radioactive Fuel Wastes: The Canadian Program" dated October 1978	October 11, 1978
C-8	"Reviews of Modern Physics" A Report to the American Physical Society by the Study Group on Nuclear Fuel Cycles and Waste Management - January 1978	October 11, 1978
C-9	"Nuclear Power Issues and Choices" A Report of the Nuclear Energy Policy Study Group Sponsored by the Ford Foundation Administered by the MITRE Corporation, 1977	October 11, 1978
C-10	"Objectives, Concepts and Strategies for the Management of Radioactive Waste Arising from Nuclear Power Programmes" A Report by a Group of Experts of the OECD Nuclear Energy Agency September 1977	October 11, 1978

Exhibit #	Title	Date Tabled
C-11	"The Management of Canada's Nuclear Wastes" A Report of a study prepared under contract for the Minister of Energy, Mines and Resources August 31, 1977	October 11, 1978
C-12A	"Handling of Spent Nuclear Fuel and Final Storage of Vitrified High Level Reprocessing Waste - Volume 1 - General" A Report from Sweden by a group called the Nuclear Fuel Safety Projects - KBS	October 11, 1978
C-12B	"Handling of Spent Nuclear Fuel and Final Storage of Vitrified High Level Reprocessing Waste - Volume 2 - Geology" A Report from Sweden by a group called the Nuclear Fuel Safety Project - KBS	October 11, 1978
C-12C	"Handling of Spent Nuclear Fuel and Final Storage of Vitrified High Level Reprocessing Waste - Volume 3 - Facilities" A Report from Sweden by a group called the Nuclear Fuel Safety Project - KBS	October 11, 1978
C-12D	"Handling of Spent Nuclear Fuel and Final Storage of Vitrified High Level Reprocessing Waste - Volume 4 - Safety Analysis" A Report from Sweden by a group called the Nuclear Fuel Safety Project - KBS	October 11, 1978
C-13	Sixth Report on Nuclear Power and The Environment Royal Commission on Environmental Pollution Chairman: Sir Brian Flowers September, 1976	October 11, 1978
C-14	"Status of Nuclear Fuel Reprocessing, Spent Fuel Storage and High-Level Waste Disposal" Overview and Summary A Report of the Nuclear Fuel Cycle Committee of the California Energy Resources Conservation and Development Commission - dated January 11, 1978	October 11, 1978
C-15	"The Disposal of Radioactive Wastes from Fission Reactors" by Bernard L. Cohen An article from Scientific American - June 1977	October 11, 1978
C-16	"Nuclear Waste Disposal: Can the Geologist Guarantee Isolation?" An article from Science Magazine August 5, 1977	October 11, 1978

Exhibit #	Title	Date Tabled
C-17	Correspondence from Dr. R.G. Hart Vice-President, Atomic Energy of Canada Limited to Sir B. Flowers, United Kingdom Atomic Energy Authority - dated January 13, 1978 and reply from Dr. Flowers to Dr. Hart - dated January 20, 1978	October 11, 1978
C-18	"Nuclear Power in Canada: Status and Prospects" by S.R. Hatcher, lecture to the Royal Swedish Academy of Engineering Sciences, Stockholm, Sweden - February 21, 1978	October 11, 1978
C-19	"Progress in Waste Management Technology" by R.G. Hart, Vice-President, Atomic Energy of Canada Limited A paper given to the Canadian Nuclear Association - June 12, 1978	October 11, 1978
C-20	United States Geological Survey circular on Geological Disposal of High-level Wastes, and accompanying memorandum from Charles Yulish Associates dated May 14, 1978	October 11, 1978
C-21	"A Natural Fission Reactor" An article from Scientific American - July 1976	October 11, 1978
C-22	"Radioactive Waste Management in Canada - A Bibliography of Published Literature" By N.J. Hawley, Atomic Energy of Canada Limited September 1978	October 11, 1978
C-23	"News about Radioactive Waste Management" A newsletter from the Whiteshell Nuclear Research Establishment dated September 11, 1978	October 11, 1978
C-24	"Canada's Nuclear Waste Program: A Preliminary Critique" by David Foster, a member of the Renfrew County Citizens for Nuclear Responsibility dated October 11, 1978	October 11, 1978
C-25	"Nuclear Wastes - A Sleeping Giant" Outline of a presentation to the Select Committee on Ontario Hydro Affairs by Gordon Edwards, October 12, 1978	October 12, 1978

Exhibit #	Title	Date Tabled
C-26	"Second Thought about Nuclear Power" A document from the Centre Report, Environment Liaison Centre A project of the U.N. Environment Programme	October 12, 1978
C-27	"Alternative Tailings Containment Methods" marked as Figure 5.1 from the MacLaren's Study, James F. MacLaren Limited	October 12, 1978
C-28	"The CCNR Publications" A list of publications available through that group	October 12, 1978
C-29	"The Threat of Nuclear War" by the Canadian Coalition for Nuclear Responsibility	October 12, 1978
C-30	"Energy: A Common Sense Policy" Presented by the Canadian Coalition for Nuclear Responsibility to the Canadian Environmental Advisory Council November 1977	October 12, 1978
C-31	"Nuclear Wastes - What, me worry?" A critique of EMR Report EP77-6 The Management of Canada's Nuclear Wastes February 1978, from the Canadian Coalition for Nuclear Responsibility	October 12, 1978
C-32	Canadian Nuclear Association presentation to the Ontario Legislature Select Committee on Ontario Hydro Affairs - October 12, 1978	October 12, 1978
C-33	Final Report of the Cluff Lake Board of Inquiry, known as the Bayda Report	October 12, 1978

Exhibit #	Title	Date Tabled
F-1	Management of Nuclear Fuel Waste Staff Introduction to a Critical Examination of the Canadian Program by the Select Committee on Ontario Hydro Affairs January 8, 1980	January 8, 1980
F-2	Management of Radioactive Fuel Wastes The Canadian Disposal Program Dated October, 1978 AECL Document 6314	January 8, 1980
F-3	Spring 1979 edition of the magazine 'Ascent' Journal of AECL	January 8, 1980
F-4	Annual Report 1978-79, AECL	January 8, 1980
F-5	Series of documents presented to Committee by Gordon Edwards. 1. Plans for Plutonium and Thorium Reprocessing in Canada by Gordon Edwards 2. Seminar, Proposed Canadian Fuel Cycle Program AECL, February 28, 1977 3. Thorium Cycles and Proliferation. Articles published in the Bulletin of the Atomic Scientists February 1979 by Amory B. Lovins	January 8, 1980
F-6	Statement by the then Minister of Energy for Ontario, The Honourable Reuben Baetz on Canada-Ontario Radioactive Waste Management Program dated June 5, 1978	January 8, 1980
F-7	First Annual Report of Canadian Nuclear Fuel Waste Management Program dated December 1979 AECL Document 6443	
F-8	Ministry of Energy presentation to the Select Committee on Ontario Hydro Affairs on the Canada-Ontario Nuclear Fuel Waste Management January 9, 1980	January 8, 1980
F-9	Disposal of Nuclear Wastes A National and International Perspective by F. Gera ¹ and H.Y. Tammemagi ²	January 9, 1980

Exhibit #	Title	Date Tabled
	1. OECD Nuclear Energy Agency, 38 Boulevard Suchet, Paris 75016. Secretariat of the Co-ordinating Group on Geologic Disposal of OECD/NEA	
	2. Whiteshell Nuclear Research Establishment, Atomic Energy of Canada Ltd., Pinawa, Manitoba, Chairman of the Co-ordinating Group on Geologic Disposal of OECD/NEA.	
F-10	Ontario Hydro Irradiated Fuel Management presented to the Select Committee on Ontario Hydro Affairs, January 9, 1980	January 9, 1980
F-10A	Letter dated February 28, 1980 addressed to Jim Fisher, signed by J.E. Wilson, Public Hearing Officer, Ontario Hydro re: Transportation of nuclear fuel	February 26, 1980
F-11	Presentation to the Select Committee on Ontario Hydro Affairs "Approach to the Regulation of Geologic Disposal of Radioactive Wastes" W.D. Smythe, Director Fuel Cycle Branch Atomic Energy Control Board January 10, 1980	January 9, 1980
F-12	AECL document 6186 "Radioactive Waste Management in Canada, a bibliography of Published Literature, by N.J. Hawley, September 1979	January 9, 1980
F-13	"Plutonic Igneous Bodies within Ontario" an inventory prepared by the Geological Survey of Canada for Atomic Energy of Canada Limited.	January 9, 1980
F-14	International Symposium on the Underground Disposal of Radioactive Waste which took place in Helsinki, Finland	January 9, 1980
F-15	Nuclear Fuel Waste Management Statement to the Ontario Select Committee on Ontario Hydro Affairs by Dr. S.R. Hatcher, Vice President and General Manager Whiteshell Nuclear Research Establishment Atomic Energy of Canada Ltd., January 9, 1980	January 10, 1980

Exhibit #	Title	Date Tabled
F-16	Comments in response to <u>A Race Against Time</u> Interim Report on Nuclear Power of Royal Commission on Electric Power Planning (Chairman: Arthur Porter) prepared by Ralph D. Torrie for the Ontario Coalition for Nuclear Responsibility December 1979	January 10, 1980
F-17	Letter dated January 17, 1980 to Mr. Donald MacDonald, Chairman Select Committee on Ontario Hydro Affairs from S.R. Hatcher, Chairman Co-ordinating Committee Canada/Ontario Nuclear Fuel Waste Management Agreement re Minutes of the Co-ordinating Committee meetings	January 22, 1980
F-17A	Canada/Ontario Radioactive Waste Management Program Co-ordinating Committee Minutes of First Meeting 1978, August 11, Ottawa	January 22, 1980
F-17B	Canada/Ontario Radioactive Fuel Waste Management Program Co-ordinating Committee Minutes of Second Meeting 1978, October 30, WNRE	January 22, 1980
F-17C	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Fourth Meeting 1979, January 04, Toronto	January 22, 1980
F-17D	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Fifth Meeting 1979, January 18, Ottawa	January 22, 1980
F-17E	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Sixth Meeting 1979, February 02, Toronto	January 22, 1980
F-17F	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Seventh Meeting 1979, February 22, Toronto	January 22, 1980

Exhibit #	Title	Date Tabled
F-17G	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Eighth Meeting 1979, February 28, Toronto	January 22, 1980
F-17H	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Ninth Meeting 1979, March 28, Ottawa	January 22, 1980
F-17I	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Tenth Meeting 1979, May 02, WNRE	January 22, 1980
F-17J	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Eleventh Meeting 1979, June 04, WNRE	January 22, 1980
F-17K	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Twelfth Meeting 1979, August 02, Toronto	February 20, 1980
F-17L	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Thirteenth Meeting 1979, September 12, WNRE	February 20, 1980
F-17M	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Fourteenth Meeting 1979, November 01, Toronto	February 20, 1980
F-17N	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Fifteenth Meeting 1979, December 05, Ottawa	February 20, 1980
F-17O	Canada/Ontario Nuclear Fuel Waste Management Co-ordinating Committee Minutes of Third Meeting 1978, November 30, Ottawa	February 20, 1980
F-18	White Lake Summary	January 22, 1980
F-18A	White Lake Information Meeting	January 22, 1980

Exhibit #	Title	Date Tabled
F-19	An Assessment of the Atomic Energy of Canada Ltd. Public Information Program on Nuclear Waste Disposal Research submitted to Ontario Legislative Select Committee on Ontario Hydro Affairs submitted by David Foster Energy Pathways Policy Research Group January 23, 1980	January 22, 1980
F-19A	Letter from Energy Pathways Policy Research Group, written by David Foster to the Select Committee on Ontario Hydro Affairs, concerning an excerpt from pages 17 and 18 of the resource information on the Ford Foundation Grants in Resources & Environment, October 1978	February 6, 1980
F-20	The Management of Radioactive Wastes in Canada Proceedings of a Symposium sponsored by the CNA Safety and Environment Committee held April 10 - 11, 1979 Constellation Hotel, Toronto, Ontario Canadian Nuclear Association 65 Queen Street Toronto, Ontario	January 22, 1980
F-21	Letter dated January 22, 1980 from Ontario Hydro, Public Hearings Officer J.E. Wilson to James Fisher, Canada Consulting Group re: Select Committee Questions on Transportation of Nuclear Fuel	January 22, 1980
F-22	Canadian Geoscience Council Published for the Council by the Geological Survey of Canada as Paper 79-10 'Disposal of High-Level Radioactive Waste' prepared by the Canadian Geoscience Council Edited by C.R. Barnes	January 22, 1980
F-22A	Canadian Geoscience Council presentation to the Select Committee on Ontario Hydro Affairs	January 24, 1980
F-23	Correspondence between Dr. S.R. Hatcher Atomic Energy of Canada Ltd. and Peter Woznesensky, Administrator Town of Ignace, Ontario re: Test drilling for suitable rock for future waste storage vaults	January 22, 1980

Exhibit #	Title	Date Tabled
F-24	Some Possible Steps Leading to Site Approval for a Demonstration Nuclear Waste Disposal Vault	January 22, 1980
F-25	Papers tabled by Dr. S.R. Hatcher on the Okla Phenomena, January 22, 1980	January 22, 1980
F-26	Chronology of Events Ignace	January 23, 1980
F-27	Handouts by Dr. S.R. Hatcher January 23, 1980; Community contacts and community information concerning areas of AECL activity in Atikokan, Ontario	January 29, 1980
F-28	Handouts by Dr. S.R. Hatcher January 23, 1980; Documents from Atomic Energy of Canada Limited entitled News about Nuclear Waste Management	January 29, 1980
F-29	Handouts by Dr. Gordon Edwards for Meeting January 10, 1980	January 29, 1980
F-30	Written Briefs presented at Public Meeting, January 15, 1980 Moose Hall, Atikokan, Ontario	January 29, 1980
F-31	Written Briefs presented at Public Meeting, January 16, 1980 Royal Edward Hotel, Thunder Bay, Ontario	January 29, 1980
F-32	Testimony of Thomas B. Cochran before the Select Committee on Ontario Hydro Affairs Hearings on Management of Radioactive Wastes January 29, 1980 under the auspices of the Natural Resources Defense Council, Inc., Washington, D.C.	January 29, 1980
F-33	Radioactive Waste Management by Thomas B. Cochran, Dimitri Rowow and Arthur R. Tamplin prepared for, U.S. Department of Energy Contract ER-78-C-01-6996 under the auspices of Natural Resources Defense Council, Inc. Washington, D.C.	January 30, 1980
F-34	Part VI -- Nuclear Regulatory Commission Disposal of High-Level Radioactive Wastes in Geologic Respositories; Proposed Licensing Procedures, Published in the Federal Register by Nuclear Regulatory Commission, Thursday, December 6, 1979	January 30, 1980

Exhibit #	Title	Date Tabled
F-35	Testimony of David M. Berick from the Environmental Policy Center Washington, D.C. Select Committee on Ontario Hydro Affairs Hearings on Management of Radioactive Wastes January 31, 1980	January 30, 1980
F-36	Report to the President by the Interagency Review Group on Nuclear Waste Management March 1979 Washington, D.C. Catalogue Number TID 29442	January 30, 1980
F-37	United States Program Leading to Disposal of Radioactive Wastes Statement to Select Committee on Ontario Hydro Affairs by Colin A. Heath, USDOE January 30, 1980	January 30, 1980
F-38	Summary Comparison of International Programs for Disposal of Nuclear Fuel Wastes Prepared by the Staff of the Select Committee on Ontario Hydro Affairs January 30, 1980 using various documents tabled with the Committee and from materials in the Ontario Hydro library	January 31, 1980
F-39	Testimony prepared for the Select Committee on Ontario Hydro Affairs January 31, 1980 By M.N. Maxey, Ph.D. Assistant Director South Carolina Energy Research Institute	January 31, 1980
F-40	Handouts by David M. Berick Meeting January 30, 1980 Re: Studies done at the University of Heidelberg in Germany on emissions of nuclear power stations	January 31, 1980
F-41	Slide Presentation of Dr. J.J. Cohen before the Committee on January 31, 1980	January 31, 1980
F-42	Suggested Nuclear Waste Management Radiological Performance Objectives Dr. J.J. Cohen, General Editor August 1978 From the Lawrence Livermore Laboratory	January 31, 1980

Exhibit #	Title	Date Tabled
F-43	"A View of Nuclear Waste Disposal from California's Perspective" by Emilio E. Varanini, 111 Commissioner and Presiding Member Nuclear Fuel Cycle Committee California Energy Commission February 1980	February 5, 1980
F-43A	Material relating to the presentation of Emilio Varanini on February 5, 1980	February 12, 1980
F-44	An article entitled, "Atikokan is Everywhere", by Randle Nelson and Graham Saunders published in the periodical " <u>Last Post</u> "	February 5, 1980
F-45	An Assessment of the Management of Canada's Nuclear Wastes (The Hare Report)	February 5, 1980
F-45A	A press release by Terry Graves and Marilyn Aarons relating to the Canada Conference on Nuclear Waste in Kirkland Lake	February 5, 1980
F-46	Submission to the Select Committee on Ontario Hydro Affairs from the Technical Advisory Committee dated February 5, 1980	February 5, 1980
F-47	Minutes of Meetings 1 to 4 of the Technical Advisory Committee to AECL on Nuclear Fuel Waste Management Program, August 8, 1979 to January 8 & 9, 1980 (minutes of meeting no. 4 are in draft form and have, at the time of tabling, not been approved)	February 6, 1980
F-48	Policy Issues in Commercial Nuclear Waste Management and Related Research and Development Statement of L. Charles Hebel before the Select Committee on Ontario Hydro Affairs, February 6, 1980	February 6, 1980
F-49	Letter from C.H. Riley of Dryden, Ontario to Donald C. MacDonald, MPP Chairman of The Select Committee on Ontario Hydro Affairs concerning the future of Nuclear Waste Disposal in the Atikokan area, dated January 24, 1980	February 6, 1980

Exhibit #	Title	Date Tabled
F-50	Remarks from the Atikokan Chamber of Commerce in Atikokan, Ontario to the Select Committee on Ontario Hydro Affairs and attached resolution passed by the Atikokan Chamber of Commerce in relation to Nuclear Energy, dated January, 1980	February 6, 1980
F-51	Letter from Margaret J. Rose of Nepean, Ontario concerning the AECL test drill site at White Lake to the Select Committee on Ontario Hydro Affairs, dated February 4, 1980	February 7, 1980
F-52	Letter from Ms. Diane Gordon, Burnstown, Ontario concerning the AECL test drill site in McNab Township, to the Select Committee on Ontario Hydro Affairs, dated January 31, 1980	February 7, 1980
F-53	Report entitled "Management of Irradiated Fuel Storage Siting Options", Prepared for Ontario Hydro by Authors, Rao, Barnes, Kortright and Naqvi Issue dated December 1979	February 7, 1980
F-54	Concluding remarks to The Ontario Select Committee on Ontario Hydro Affairs, by Dr. S.R. Hatcher, Vice President and General Manager Whiteshell Nuclear Research Establishment Atomic Energy of Canada Limited February 7, 1980	February 7, 1980
F-55	On the official record of The Reactor Safety Hearings	
F-56	On the official record of The Reactor Safety Hearings	
F-57	On the official record of The Reactor Safety Hearings	
F-58	On the official record of The Reactor Safety Hearings	
F-59	On the official record of The Reactor Safety Hearings	

Exhibit #	Title	Date Tabled
F-60	Letter addressed to Donald MacDonald, Chairman from Atomic Energy of Canada Limited Research Co. signed by Dr. S.R. Hatcher, Chairman of the Co-ordinating Committee, dated February 12, 1980 Letter serves as a covering letter indicating the enclosure of minutes to meetings of the Co-ordinating Committee, <u>(The minutes and their contents can be found as exhibits F-17K to F-170)</u>	February 14, 1980
F-61	On the official record of The Reactor Safety Hearings	
F-62	On the official record of The Reactor Safety Hearings	
F-63	On the official record of The Reactor Safety Hearings	
F-64	On the official record of The Reactor Safety Hearings	
F-65	Letter from Malcolm Rowan, The Deputy Minister of Energy addressed to Alan Schwartz, Counsel for the Select Committee on Ontario Hydro Affairs, dated February 6, 1980, contents read: "As I undertook at the January 8, 1979, hearing of the Select Committee, I am forwarding copies of the letters exchanged between the federal Minister of Energy, Mines and Resources and the Ontario Minister of Energy on June 3, 1979, with regard to the Canada/Ontario nuclear fuel waste management joint statement of June 5, 1978.	February 20, 1980
F-66	Brief on high level nuclear waste disposal, entitled Community Relations and Scientific Uncertainty, presented to this committee by the Renfrew County Citizens for Nuclear Responsibility dated February 27, 1980	February 27, 1980
F-66A	Hand-drawn diagram entitled Illustration of a Lifetime of Data Related to Two Possible Reaction Types	February 27, 1980
F-67	Series of letters which have been received from various persons in the White Lake area. Several letters attached to the same document.	February 27, 1980

Exhibit #	Title	Date Tabled
F-68	Correspondence dated August 24, 1977, addressed to Mr. Ian Moffatt by Atomic Energy of Canada Limited, signed by Mr. Burge and correspondence relating to it.	February 28, 1980
F-69	Emergency Response Guide for Dangerous Goods	February 28, 1980
F-70	Transportation of Nuclear Fuel, by D.R. Prowse. An AECL Publication	February 28, 1980
F-71	Letter addressed to the Ontario Select Committee on Ontario Hydro Affairs signed by William Larocque, Reeve, Township of Darling, Lanark, Ontario dated February 23, 1980 Re: Nuclear Waste Disposal	March 27, 1980
F-72	Letter addressed to Alan Schwartz, Counsel for Select Committee on Ontario Hydro Affairs dated March 12, 1980 from Malcolm Rowan, Deputy Minister for Ministry of Energy, Queen's Park, Toronto in response to a request concerning irradiated fuel management. Enclosure is a letter from Malcolm Rowan to Mr. D.J. Gordon, President, Ontario Hydro which outlines the Cabinet's decision of April 25, 1978 on Management of Irradiated Fuels.	March 27, 1980
F-73	A letter from R.W. Blackburn, Secretary, Atomic Energy Control Board dated March 25, 1980 to Mr. Donald C. MacDonald, Chairman Select Committee on Ontario Hydro Affairs on the subject of the availability of AECB guidelines and/or criteria relating to the disposal of high-level radioactive waste in geological media.	March 27, 1980
F-74	Press Release from the Office of the White House Press Secretary to the Congress of the United States re USA Radioactive Waste Management Program -- date of release is February 12, 1980	March 27, 1980
F-75	Staff Summary for Select Committee on Ontario Hydro Affairs entitled "Giving a New Perspective to Canadian Nuclear Fuel Waste Management", dated March 27, 1980	March 27, 1980
F-76	Letter from Robert Welch, Minister of Energy, Ministry of Energy and dated March 28, 1980 addressed to Mr. Donald C. MacDonald, Chairman Select Committee on Ontario Hydro Affairs, outlining an undertaking to provide further information made to the Committee on March 13, 1980 with regard to two questions raised by Jim Foulds:	April 10, 1980

Exhibit #	Title	Date Tabled
	<p>(i) request for actual dates when community relations proposals were before the Co-ordinating Committee for November-December 1979 and were either withdrawn or approved</p> <p>(ii) request for information with regard to a general field study proposal involving organized and unorganized territories in the Thunder Bay area</p>	
F-77	<p>Memorandum dated May 2, 1980 to Alan Schwartz, Committee Counsel from Malcolm Rowan, Deputy Minister of Energy re: Staff Summary for Select Committee on Ontario Hydro Affairs dated March 27, 1980</p>	June 4, 1980

APPENDIX F

LIST OF RECOMMENDATIONS

APPENDIX F

LIST OF RECOMMENDATIONS

- RECOMMENDATION I THE AECB SHOULD MAKE KNOWN ITS CURRENT CRITERIA FOR REGULATING THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS AND ENCOURAGE PUBLIC DEBATE AND CRITICISM OF THEM; MUNICIPALITIES SHOULD, IN THE EVENT OF AN ACCIDENT, BE ABLE TO GET INFORMATION ON THE RADIOACTIVE MATERIALS IN THE SHIPMENTS, SHOULD HAVE THEIR STAFFS TRAINED TO HANDLE ACCIDENTS AND SHOULD BE PREPARED FOR AN EMERGENCY RESPONSE.
- RECOMMENDATION II THE GOVERNMENT OF ONTARIO SHOULD CEASE ITS OBSTRUCTION OF PROPOSALS TO INVESTIGATE AVAILABLE SOFT ROCKS IN THE FIELD AND SHOULD, INSTEAD, ENCOURAGE ALL APPROPRIATE FIELD RESEARCH.
- RECOMMENDATION III AECL SHOULD MORE ACTIVELY SEEK OUT THE INFORMED CRITICISM OF THE TECHNICAL COMMUNITY BY SUBMITTING MORE TECHNICAL PAPERS TO THE PEER REVIEW PROCESS OF THE SCIENTIFIC LITERATURE AND BY TAKING THE INITIATIVE IN SPONSORING TECHNICAL SYMPOSIA WHERE CRITICAL DISCUSSION IS ENCOURAGED.
- RECOMMENDATION IV THE GOVERNMENTS OF CANADA AND OF ONTARIO SHOULD ESTABLISH UNDER JOINT OWNERSHIP A NUCLEAR FUEL WASTE MANAGEMENT AGENCY THAT WOULD HAVE OVERALL RESPONSIBILITY FOR THE CANADIAN PROGRAM FROM THE RESEARCH PHASE THROUGH TO FULL COMMERCIAL OPERATION OF A REPOSITORY FOR HIGH LEVEL WASTES PRODUCED IN THE PROVINCE OF ONTARIO.
- RECOMMENDATION V THE NUCLEAR FUEL WASTE MANAGEMENT AGENCY SHOULD BE CONTROLLED BY A BOARD HALF OF WHOSE MEMBERS ARE SELECTED BY THE FEDERAL GOVERNMENT AND HALF BY THE ONTARIO GOVERNMENT.

- RECOMMENDATION VI THE NUCLEAR FUEL WASTE MANAGEMENT AGENCY SHOULD BE GIVEN AUTHORITY TO CONDUCT SUCH FIELD STUDIES AS ARE NECESSARY TO CHARACTERIZE THE SOFT ROCKS AVAILABLE IN ONTARIO THAT MIGHT BE SUITABLE AS A WASTE REPOSITORY.
- RECOMMENDATION VII FOR PURPOSES OF FIELD RESEARCH, COMMUNITY INVOLVEMENT SHOULD INCLUDE THOSE PEOPLE IN THE GEOGRAPHICAL AREA DIRECTLY AFFECTED BY THE RESEARCH WITHOUT SPECIFIC REGARD TO MUNICIPAL BOUNDARIES. THOSE PEOPLE SHOULD BE ASSURED THAT THEY WILL: BE FULLY INFORMED ABOUT THE EXACT NATURE OF THE WORK BEING UNDERTAKEN, INCLUDING ANY AND ALL RISKS ASSOCIATED WITH IT; HAVE AN OPPORTUNITY TO ASK QUESTIONS ON A REGULAR BASIS OF RESPONSIBLE OFFICIALS RELATING TO ANY ASPECT OF THE RESEARCH PROGRAM; HAVE AN OPPORTUNITY TO EXPRESS POINTS OF VIEW ABOUT DIRECT IMPACTS OF THE RESEARCH TO THE AGENCY RESPONSIBLE EITHER DIRECTLY OR THROUGH LOCAL REPRESENTATIVES.
- RECOMMENDATION VIII IN THE SELECTION OF A SITE FOR DEMONSTRATION LEADING TO THE EMPLACEMENT OF NUCLEAR WASTES, COMMUNITY INVOLVEMENT SHOULD INCLUDE THOSE PEOPLE THAT FEEL AFFECTED BY THE DECISION. ALL CITIZENS SHOULD: HAVE THE RIGHT TO BE FULLY INFORMED ABOUT THE EXACT NATURE OF THE WASTE DISPOSAL PROGRAM INCLUDING ANY AND ALL RISKS ASSOCIATED WITH IT; HAVE AN OPPORTUNITY TO ASK QUESTIONS ON A REGULAR BASIS OF RESPONSIBLE OFFICIALS RELATING TO ANY ASPECT OF THE ENTIRE PROGRAM; HAVE THE RIGHT TO EXPRESS POINTS OF VIEW TO AN INDEPENDENT DECISION-MAKING BODY RESPONSIBLE FOR PROTECTING PUBLIC HEALTH AND SAFETY. THE DECISION MAKING BODY WILL HOLD PUBLIC HEARINGS IN THE AREAS OF THE PROVINCE MOST DIRECTLY AFFECTED BY THE DEMONSTRATION AND OPERATION OF THE REPOSITORY.
- RECOMMENDATION IX THE GOVERNMENTS OF CANADA AND ONTARIO ACCEPT THE URGENCY OF CLARIFYING RESPONSIBILITY FOR REGULATORY APPROVAL OF NUCLEAR FUEL WASTE MANAGEMENT.

RECOMMENDATION X

THE HEARING PROCESS CHOSEN MUST ADHERE TO THE FOLLOWING PRINCIPLES OF: SEPARATE HEARINGS TO SET GUIDING CRITERIA AND TO ASSESS SPECIFIC PROPOSALS; FULLY PUBLIC HEARINGS IN ALL AFFECTED REGIONS; THE AVAILABILITY OF FUNDING TO ENSURE FULL PUBLIC INVOLVEMENT; A HEARING PROCESS AND BASIS FOR DECISION THAT TAKES INTO ACCOUNT ALL THE FACTORS A COMMUNITY WISHES TO RAISE; FINAL DECISION ON THE SITE BY RESPONSIBLE GOVERNMENTS ON THE RECOMMENDATION OF THE REGULATORY BODY.

RECOMMENDATION XI

THE FIRST TASK OF THE ASSIGNED REGULATORY AUTHORITY SHOULD BE TO STIMULATE PUBLIC DISCUSSION OF OVERALL CRITERIA INCLUDING THE HOLDING OF A PUBLIC HEARING.



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